EuroSDR

Annual report 2013

About EuroSDR

EuroSDR is a pan-European organisation established by International Treaty, as OEEPE, in 1953 in Paris in accordance with a recommendation passed by the Council of the Organisation for European Economic Co-operation. The spatial data research interests of European Countries are represented through the membership in EuroSDR of national organisations from their prodcution and research sectors.

The result is a network of delegates, from European Geographic Information organisations and research institutes, effectively and practically addressing Europe's spatial data research requirements.

Collaborative research projects address the aquisition, management and delivery of spatial data and services while international workshops and courses, in collaboration with related organisations, address key issues in a timely and focussed manner.

Our Member States and their Prime Delegates (2013)

Austria	Michael Franzen	Bundesamt für Eich- und Vermessungswesen (BEV)
Belgium	Ingrid Vanden Berghe	Nationaal Geografisch Instituut
Croatia	Željko Hećimović	State Geodetic Administration
Cyprus	Andreas Sokratous	Department of Lands and Surveys
Denmark	Thorben Hansen	Kort & Matrikelstryrelsen
Finland	Juha Hyyppa	Geodeettinen Laitos
France	Bénédicte Bucher	Institut Géographique National
Germany	Hansjorg Kutterer	Bundesamt für Kartographie und Geodäsie
Ireland	Andy McGill	Ordnance Survey Ireland
Italy	Fabio Crosilla	University of Udine
Norway	Jon Arne Trollvik	Statens Kartverk
Spain	Antonio Arozarena	Instituto Geografico Nacional
Sweden	Mikael Lilje	Lantmäteriet
Switzerland	Francois Golay	Ecole polytechnique fédérale de Lausanne (EPFL)
The Netherlands	Jantien Stoter	Technical University of Delft and NL Kadaster
United Kingdom	Malcolm Havercroft	Ordnance Survey of Great Britain

Vision

The vision of EuroSDR is to be the European research platform for National Mapping and Cadastral Agencies, Academic Institutes, the Private Sector, Industry and User Groups on issues related to the implementation of technology developments with respect to optimising the provision (collection, processing, storage, maintenance, visualisation, dissemination and use) of reference information (data serving as a spatial framework for organisations involved in monitoring, management and development) in a Geoinformation Infrastructure (GI) context.

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1. Message from the President Thorben Brigsted Hansen

2013 was a special year for EuroSDR. It was the year we celebrated our 60 years anniversary and the year we discussed the guides that will ensure that EuroSDR stays as relevant for its stake holders in the future as it has been in the past 60 years.

EuroSDR (then OEEPE) was founded in autumn 1953 and we celebrated the 60 years anniversary at the 123rd Board of Delegates Meeting in Gävle, Sweden in October 2013. Present were – besides the delegates – distinguished guest from our sister associations, and some of the people that played leading roles in the early days of OEEPE/EuroSDR and helped EuroSDR develop into the association it is today.

The guests contributed with interesting insights regarding our industry. A development is seen, where (spatial) technology disciplines become increasingly integrated, and where the spatial dimension of real world objects and properties plays an increasing role for many uses. How do we best cooperate in such environment, and how do we best make sure that spatial data research contributes to a still more diverse set of applications and at the same time is recognised and developed as a research discipline in its own right? Many views and ideas were shared in a collaborative atmosphere.

Spatial data are becoming pervasive in today's society. Spatial data are in the core of many applications and everybody can access maps and other geographic information e.g. via mobile phones. Creating spatial data is also becoming increasingly easy: mobile devices have GPS that can feed simple spatial data collection and even larger scale production of spatial data become still more affordable, for instance by using inexpensive drones equipped with inexpensive data collection devices. This result in an unprecedented amount of spatial data becoming available from different sources, created for different purposes – and with different quality.

Geographic information is extremely powerful when it comes to overlaying and analysing real world objects and properties. Spatial data are the foundation for this, and government decisions rely heavily on such data for decision making that profoundly affect citizens. How do we make sure that we know which data to trust and which not for such decisions?

In order to gain maximum benefit from the technological advancements, authoritative quality measures must be supported and spatial data professionals not only need to know about data collection and data processing, but must also know about big data, data mining and data integration – with special attention to the quality aspects of data. Research based knowledge must be available in order to take advantage of the new technologies and to ensure that the spatial data are reliable for what they are used for.

The importance of available and reliable spatial data is increasingly recognised worldwide. United Nations (UN) has formed a Committee of Experts on Global Geospatial Information Management (known more manageable as UN-GGIM) where representatives of Member States from all regions of the World meet to develop effective strategies on how to build and strengthen capacity for the

management of geospatial information. The committee was established in 2011 and the July 2013 meeting in Cambridge, UK marked a milestone where reports were presented giving an overview of the current situation and industry trends seen from a global perspective. A regional structure supporting capacity building and knowledge exchange is part of the overall UN-GGIM picture, and with UN-GGIM Europe coming up with the declared goal of taking maximum benefit of existing structures in Europe, EuroSDR is ready to play a role in this initiative.

2013 was also the year where EuroSDR did the ground work for a new strategy for the association. In an ever changing world any organisation must constantly have an eye on its vision, mission and strategic objectives. The EuroSDR strategy was last renewed in 2009 and early 2013 the Executive Team decided to run a process involving the delegates and prime stake holders with the goal of presenting a draft for a new strategy at the spring 2014 Board of Delegates meeting.

As part of the process, we have looked at our strengths, at where we have room for improvements, and at the opportunities and threats that our industry presents. It is a positive and useful process that so far has reassured us about the value of our research network and the unique alliance it represents between government and academia in Europe. We have also identified areas that need attention: industry involvement in research activities, research funding and attracting young geo-professionals to mention some of the issues that most likely will be dealt with in the new strategy.
One thing that I particularly have taken notice of is, that we seem to be dealing with the same challenges within the spatial data research area across our member countries. By identifying the commonalities and by working together on solving the challenges, we can achieve much more than we can if government works independent from academia or if each country works independent from other countries. EuroSDR is in a unique position to further develop how spatial data model real world objects and properties and present them visually, to promote applications demonstrating how citizens benefit from reliable spatial data and to provide research based knowledge that advances Europe.

I would like to thank professor Dieter Fritsch, for his contribution to the success of EuroSDR during his four years as vice-president. Dieter Fritsch completed his term at our 123rd Board of Delegates meeting in Gävle in October and is replaced by André Streilein.
At the same meeting Lars Bernard stepped down as chairman of commission 5 and handed over to Jeremy Morley. I would like to thank Lars for his contribution to EuroSDR.

2. Message from the Vice-President André Streilein

2013 was an intense and prosperous year for EuroSDR. It was not only the year, where we could look at 60 years of our association and the impact the members of EuroSDR made on science in photogrammetry / remote sensing and geographic information systems as well as the impact within the mapping community. It was also a year of many practical achievements in a more heterogeneous, and maybe also a more complex, research environment as in 1953, where data collection, data restitution, and deliverables was entirely analogue.

It is characteristic for our organisation, that the improvements are achieved by common tests, workshops, cooperation with partner organisations, and the exchange of experiences with other organisations. This was reflected at the special session '60 Years Anniversary of OEEPE and EuroSDR", where representatives of our partner organisations Eurogeographics, Association of Geographic Information Laboratories in Europe (AGILE), International Society for Photogrammetry and Remote Sensing (ISPRS), International Cartographic Association (ICA), Open Geospatial Consortium (OGC) and the European Association of Remote Sensing Laboratories (EARSel) gave a review on the collaboration with their organization and explore possibilities for further future collaboration with EuroSDR.

The main research activites of EuroSDR deal with:

- Rapid technical development (ict, sensors, processes, vgi, rpas, mobile devices, etc.),
- Growing demand for up-to-date spatio-temporal, 3D, multi-scale data and services and
- Increasing focus on data integration and quality issues.

With respect to new platforms, unmanned aerial vehicle (UAV) or remotely piloted aircraft systems (RPAS), EuroSDR participated and supported the UAV-g conference in Rostock (Germany), in collaboration with ISPRS, as well as the RPAS 2013 conference in Bruxelles (Belgium). EuroSDR contributed also to the RPAS Yearbook 2013 with the paper: "The Relevance of RPAS for NMCAs in Europe". In addition, an EuroSDR survey is prepared and useful datasets are collected to evaluate their performances for mapping purposes.

With respect to new sensors, EuroSDR initiated new research on oblique imagery from airborne platforms. New oblique imagery systems will come out in the market very soon, oblique airborne images will become complementary to the traditional large format nadir images with a high potential for many new applications. Hence, there is a demand for research and standard software for automation.

EuroSDR finalised the project 'Benchmarking of Image Matching Approaches for DSM Computation' with the analysis of the results from two test areas Vaihingen and Munich. Two successful workshops were organized as part of the project. The state-of-the-art, potential and limitations of existing software systems were evaluated resulting into the conclusion that the matching quality depends on surface types, land use, image overlap, and block configuration. From the outcome of the second workshop, it was obvious that relevant open research issues on "dense image matching" like, the investigating for different types of land use, block figurations; extention of the analysis from 2.5 DSM

to (meshed) 3D Point Clouds by defining quality indicators for 3D points and blunder detecting, filtering, simplifying and meshing; organisation of additional 3D test data flights with the use of LiDAR as reference and oblique imagery for built-up areas.

With respect to Volunteered Geographic Information (VGI) EuroSDR participates actively in two COST actions. The Action IC 1203 (ENERGIC - European Network Exploring Research into Geospatial Information Crowdsourcing) deals with software and methodologies for harnessing geographic information from the crowd. Whereas TD1202 (MACS - Mapping and the citizen sensor) seeks to increase the value of volunteered data provided by citizen sensors for mapping applications, with a particular focus on map production and map evaluation. Investigation on how the use of Volunteered Geographic Information can aid the production of mapping within the COST member states from Europe and beyond.

The EuroSDR Archiving Working Group finalised an already highly recognized position paper entitled: 'GI+100: Long term preservation of digital Geographic Information - 16 fundamental principles agreed by National Mapping Agencies and Archives'. This position paper is officially approved by EuroSDR, by EuroGeographics and by the European Board of National Archivists (EBNA), and is a very need example of EuroSDR cross science and cross organisational activities.
In the research field of 'Generalisation and Multi-representation' EuroSDR supported a Workshop of ICA in the tradition of pre-conference workshops in association with the ICA Commission on Generalisation and Multiple Representation and the ICA Commission on Map Production and Geo-Business. In addition a workshop on 'Designing multi-representation and multi-scale databases: sharing experience between national and regional mapping agencies' was organised and a workshop report was compiled. This report provides a good overview of the state-of-the-art of automated generalisation used in production of multi-scale maps at National Mapping Agencies as well as the remaining research questions.

Furthermore there are relevant developments going on in the field of geo-information databases and information structures. The most important trends that influences the work of NMCA's are data revolution and the increasing number of users and usages of spatial data. The associated challenge is to assure appropriate use of lots of highly heterogeneous spatial data in a meaningful way: making big data small; information retrieval from data; data structuring, filtering, data mining, interpretation; and solutions at machine level. Another challenge for governmental organisations is to re-use what's already there; Collect once, use many times.
The domain of data specifications and SDIs in the broader sense is very dynamic, requiring that NMCAs, industry, and research institutes need to work together, and bridges have to be built to transfer research into implementation.

In terms of knowledge transfer EuroSDR is continuously active in documenting the outcome of their research results and workshop results in their publication series. In addition this knowledge is disseminated via the Educational Service EduServ. The 11th series of the Educational Service was running in 2013 and consists of the following courses: "Radiometric performance of Digital Photogrammetric Cameras and Laser Scanners" organized by Finnish Geodetic Institute and TU Vienna, "Open Standards & Open Source WebMapping" hosted by ITC University of Twente, "High density image matching" organized by Stuttgart University and "Integrated use of airborne laser scanning and aerial photogrammetry" tutored by Aalto University. In total 39 participants. from 20, mostly European, countries attended these courses.

3. Interesting examples of real life practices at NMCAs based on results of existing applied research.

3.1. BELGIUM: CartoWeb.be: a WMTS offering a screen-friendly representation of our most recent data

Frédérique Spitaels, Nationaal Geografisch Instituut

The *CartoWeb.be* project was launched in 2011 in order to answer several internal and external demands.

Since making maps in the classical, analogue way is expensive and takes a long time, the National Geographic Institute felt the need to develop a new product, specifically destined for on-screen viewing. Its production and publishing processes would be automatic, allowing a fast dissemination of the NGI's updated data through the Internet by means of a cached view service. This new product would also meet the expectations and practices of the present-day society where digital supports have become part of our daily life.

Developing such a product was a real challenge for the NGI: we had to begin from scratch with regard to WEB technologies and symbolization rules for on-screen viewing. The ideas and experiences we exchanged during the EuroSDR workshops helped us to make certain decisions, but they also confirmed that rules for a semiologic representation did not exist yet for the screen: we had to define and to test everything! The whole workflow was split up into three processes: UPDATE, PRODUCE and PUBLISH.

The result is a multiple representation mapping (TOPO) which covers 11 scale levels, going from 1:4 000 000 to 1:2500. The semantic contents are adapted to each viewing level, offering much generalized maps at the small scales, classic topographic maps at the intermediary scales and plan-like maps at the large scales, notably through the topographic details, toponymy and street names. CartoWeb's representation was developed as a whole, which guarantees a user-friendly and smooth transition between the different scale levels.

We should add that for the four largest scales (1:2 500, 1:5 000, 1:10 000, 1:25 000), a second type of representation has been developed (OVERLAY). This is an overlay symbolization which can be put on top of a « base layer », for instance orthophotographs or the client's own data.

A little bit more than two years went by between the first draft and the implementation, and the CartoWeb team (some fifteen persons were involved) could proudly present the project to the press on 13 December 2013.

The users' first feedbacks were very positive and gave us inspiration for a new version of the product which will be available five months after its first publication.

The service's URL: *http://www.ngi.be/cartoweb/1.0.0/WMTSCapabilities.xml*
The technical specifications: *http://www.ign.be/cartoweb/cartoweb_specification.pdf*
The INSPIRE metadata: *http://metadata.ngi.be/metadata*

3.2. FRANCE: SCAN Express and on-demand mapping at IGN-France
Arnaud Braun, IGN-France

SCAN Express is a new product designed at IGN France to provide high quality rendering of IGN topographic databases, over the -French territory, fully updated every six months, at medium to small scales with a visual continuous effect. It is available since 2013 through the French Géoportail WMS and WMTS services (http://api.ign.fr).

Research results have been transferred in a very fast innovation cycle to yield vector cartographic data on the whole territory based on topographic data. The current process is able to handle the whole territory in 3000 hours, i.e. less than 5 days with 3 servers and 30 processors. It is followed by some control and light interactive corrections.

Main tasks that are performed entirely automatically on the topographic data are :

- Creation of city blocks from building layers.
- Points of Interests (POI) matching with real world objects.
- Name formatting: capitalization, abbreviation…
- Symbol orientation (for instance orientation of churches' crosses).
- Building generalization.
- Boundaries and itineraries matching with roads and hydrographic networks.
- Boundaries and itineraries offsetting.
- Computing symbolization relevant to the selected scale.
- Elimination of duplicated or redundant features.
- Label placement.
- Upload modifications in the central database.

Two different color charts are available to define the styles: the "classical" styles correspond to IGN classical topographic paper maps, the "standard" styles offer pastel colors, so that other data can be added to the map, and keep it readable. Besides, a suite of styles have been designed to support some visual continuity in the change of scale. Last, the user may select required themes and colors on his map.
Open source software GeoServer is used to produce raster tiles (more on http://blog.geoserver.org/2014/01/07/using-geoserver-at-ign-the-french-national-mapping-agency-to-create-new-digital-maps/).
More research results requiring a longer maturation cycle will be further integrated in this process.

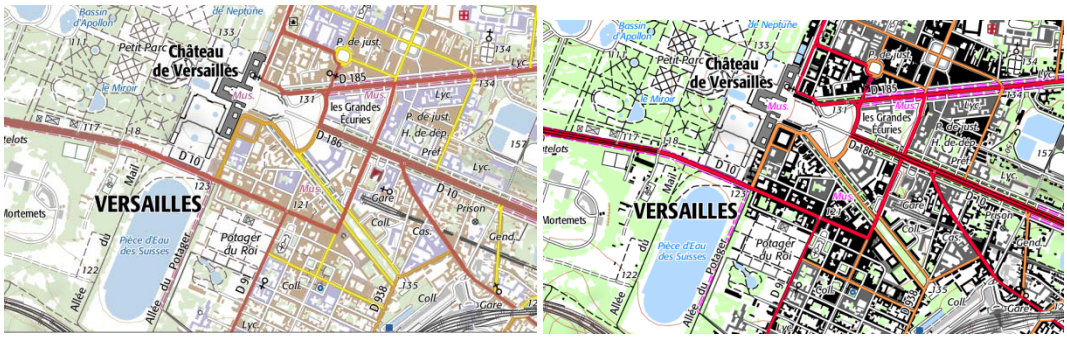


Figure 1: 1:25 000 – Standard styles and classical styles.

3.3. GERMANY: The 3D Building Model of Bavaria in Level of Detail 2 with statewide coverage

Dr. Klement Aringer, Josef Dorsch, Bavarian Agency for Digitization, Broadband and Surveying (LDBV)

In Bavaria there are optimum conditions for the production of a statewide three dimensional Building Model because of existing geodata from the Surveying Administration.
In 2010, the first step has been reached with the realization of a statewide 3D Building Model in the Level of Detail 1 (LoD1). All 8.1 million buildings of Bavaria are represented in a block model with flat roofs.

For the acquisition of the 3D Building Model in LoD2 with standardized roof shapes, LiDAR-data is used to derive the height and roof shape of the buildings. The point density of the LiDAR-data is 1 up to 4 points/m². The Digital Terrain Model (DTM) with a grid spacing of 1m is necessary for the calculation of the relative height of the buildings. The basis for the exact outline of the buildings is the official digital cadastral map. The update process is realized by terrestrial building measurements within the maintenance process of the cadastre. For buildings, which were built after the LiDAR campaign and before the beginning of the terrestrial update process, the new roof shapes are captured by a Digital Surface Model (DSM) based on aerial images. Every three years there is a regular statewide coverage with aerial photos in a ground resolution of 20 cm. A DSM derived from image matching enables the modeling of new buildings or buildings with changed roofs.

The reconstruction of the 3D Building Model is a semiautomatic process in combination with LiDAR-data, DTM, building outlines from the cadastre, Digital Orthophotos and a catalog of 13 standardized roof shapes. The software “BuildingReconstruction” calculates a planmetric fragmentation and approximates one or more roof shapes for every building. The operator reworks and verifies the fragmentation and the approximation of each roof shape. For editing and improving the roof shapes, the software provides an editing window in a 2D- and 3D-view (Figure 1). The result of each interactive processing step is instantly shown in the 3D-view. The post-editing rate is depending on the point density of the LiDAR-data and the complexity of the buildings. The rate varies between 15 % in modern cities to more than 40 % in historic city centers.

The post-editing is done by more than 30 operators at 5 offices in Bavaria. The software and the workflow enable a decentralised work; the result of the 3D Building Model is exported in CityGML with additional semantic information. A relational database based on the open source database solution “3DCityDB” is used for data storage. A FME Workbench converts CityGML into different 3D formats like KML/Collada, 3D shape, dxf, 3ds and sketchUp.

The first reconstruction process of the 3D Building Model in LoD2 will be finished by 2016. Nevertheless the update process of LoD2 will be implemented before 2016 already. The terrestrial building measurements will be integrated into the German Authoritative Real Estate Cadastre Information System (ALKIS®). The aim is, to implement an automatic update process with interactive post-editing for a maximum of 10 % of the new or changed buildings.

To stimulate the use of 3D geodata and technologies a new EuroSDR 3D SIG (special interest group) was established with a first meeting in London in December 2013 (participant of LDBV: Mr. Josef Dorsch).

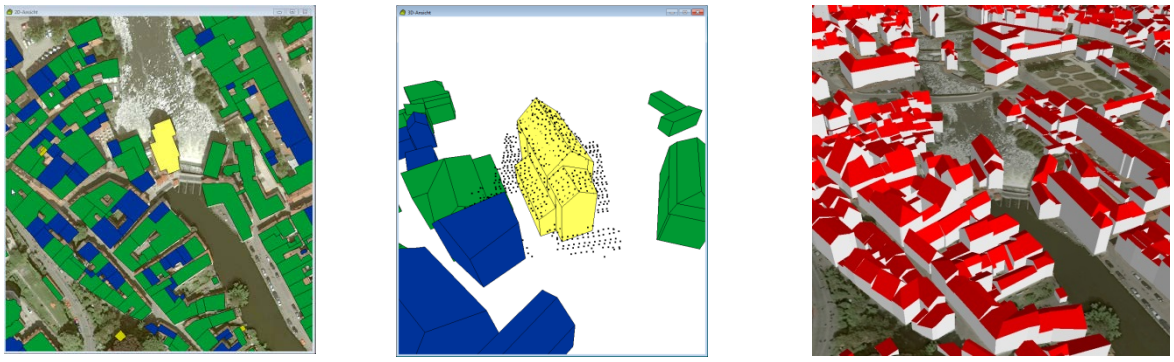


Figure 2: Reconstruction of 3D Building Model (LoD2) in the historic city center of Bamberg with 2D editing window (left), 3D view with corresponding laser point cloud (middle) and visualisation of the result in CityGML combined with a DOP (right).

3.4. THE NETHERLANDS: Innovation at Kadaster the Netherlands: cable and pipeline-information service

Ad van Houtum, Jantien Stoter, Martijn Rijsdijk, Kadaster

The Netherlands' subsoil contains about 2 million kilometres of cables and pipelines. Over years, various initiatives have been carried out to reduce risks of accidents during excavations.

This has led to the development of a digital portal that provides reliable and accurate information about the location of cables and pipelines in the subsoil, i.e. KLIC online (*Kabels en Leidingen Informatie Centrum;* Cables and Pipelines Information Centre). This portal is online since 2010 and maintained by the Cadastre, Land Registry and Mapping Agency (Kadaster). Everyone who wants to dig in the subsoil is obliged by law to query this portal, where (s)he can indicate the area of interest with a polygon. By law, the network operators (NO) must provide the location of cables and pipes in that area to the Kadaster. To identify which network operators have cables or pipelines in that specific area, the Kadaster uses convex hulls that the network operators have registered for their networks. For every involved network, the network operator provides a separate map containing the exact location of the network in transparent PNG-format. The Kadaster combines the information on all cables and pipelines and provides this information to the customer in PDF who did either a "Dig Alert", a "Disaster Alert" or "a request for orientation". The overall aim is to prevent digging excavation damage.

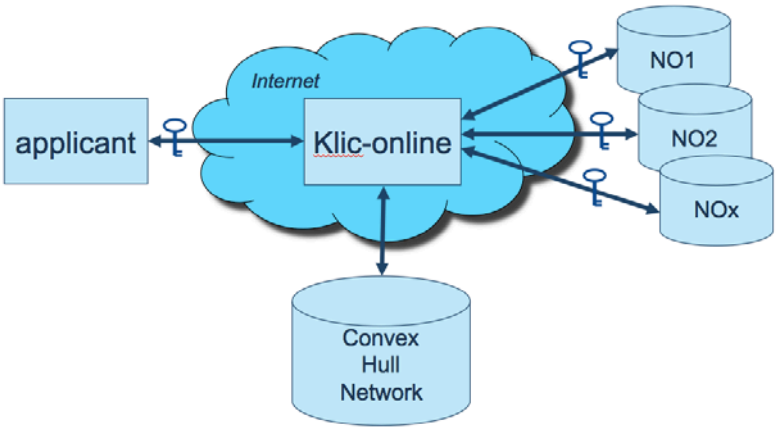
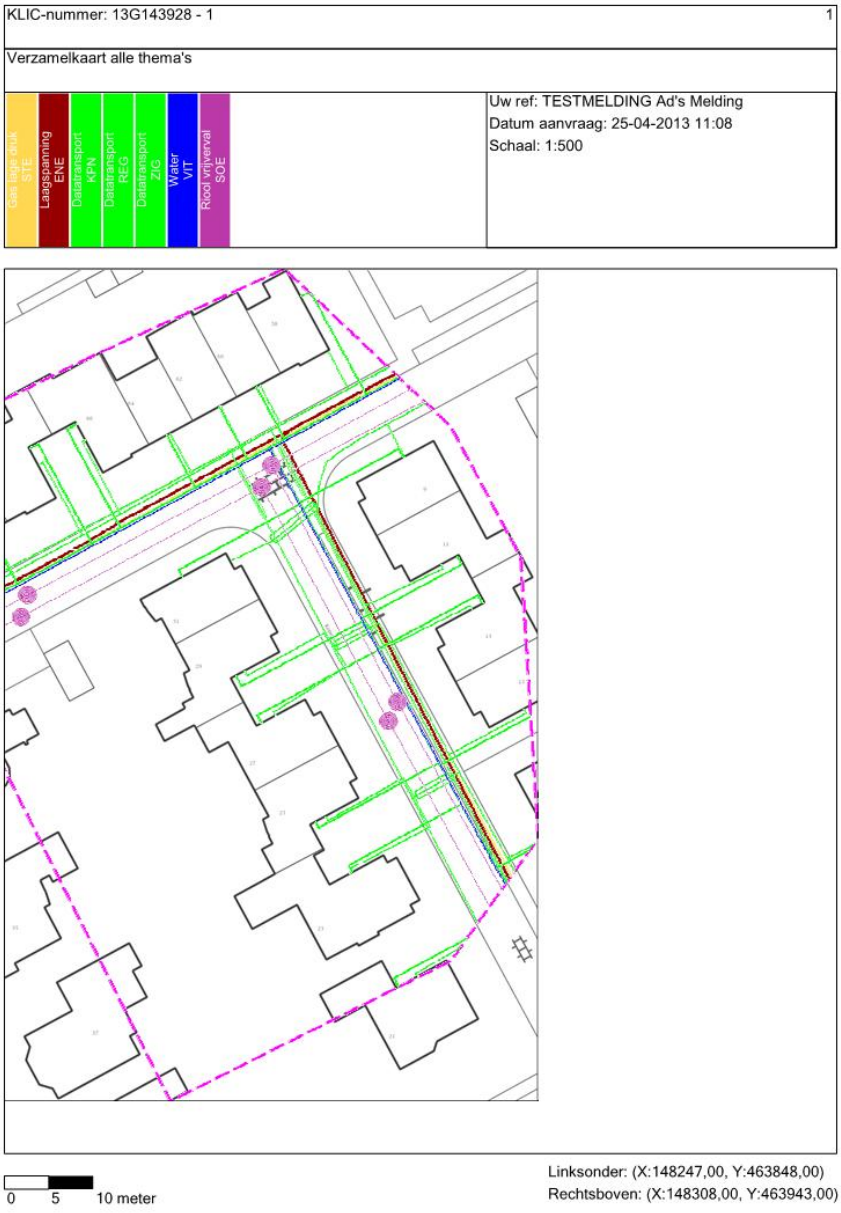


Figure 3: Schematic overview of KLIC-online architecture

Recent studies showed that further development of the portal is necessary to provide accurate and reliable subsoil information. That is, the provided information needs to be ubiquitous (omnipresent), continuously available (24x7), without waiting (near real time), and presented at any location and on any user platform. Besides information on the location of cables and pipelines, other information should be presented such as planned topography, type of soil, ground water, cadastral boundaries, address etc. In addition, the delivered information needs to be inter-operable with third parties systems in order to be able to further process the data by third parties. Based on these requirements, KLIC-online is further developed.

Currently it is studied how to make KLIC-online INSPIRE compliant for Utility Services. According to the directive about 800 out of 1000 Dutch network operators are INSPIRE-mandatory. It would require huge costs if every network operator would need to manage these obligations on his own. Therefore, it was decided to join forces in KLIC-online as INSPIRE portal. In 2014 the involved network operators must publish their metadata on the national portal and have their webservices operational with the data as is. By 2020 the data should be harmonized with de European data model.

Figure 4: Screenshot of PDF provided to the user who queries KLIC-online



KLIC-nummer: 13G143928 - 1 1

Verzamelkaart alle thema's

Gas lage druk STE
Laagspanning ENE
Datatransport KPN
Datatransport REG
Datatransport ZIG
Water VIT
Riool vrijverval SOE

Uw ref: TESTMELDING Ad's Melding
Datum aanvraag: 25-04-2013 11:08
Schaal: 1:500

0 5 10 meter

Linksonder: (X:148247,00, Y:463848,00)
Rechtsboven: (X:148308,00, Y:463943,00)

3.5. SWEDEN: Research using Lantmäteriets 3D data from airborne laser scanning and digital aerial photographs for environmental mapping and monitoring

Heather Reese, Lantmäteriet

In 2009, Lantmäteriet launched Sweden's national airborne laser scanning program with the aim of creating a new national digital elevation model (DEM) with higher accuracy and finer grid cell size. Although the national scanning is not yet complete, the DEM as well as the raw laser data point cloud produced from this undertaking are being used for multiple applications. Digital aerial photographs acquired by Lantmäteriet can also be used to create 3D point cloud data of the canopy surface; together with the DEM from laser scanning canopy height models (CHM) can be constructed from these aerial photographs. The Swedish Environmental Protection Agency (SEPA) wanted to investigate the application of Lantmäteriet's 3D data for environmental mapping purposes. To this end, SEPA granted five years of funding (2009-2013) towards the research program EMMA or Environmental Mapping and Monitoring using Airborne laser and digital images (http://emma.slu.se), which was divided into a terrestrial and an aquatic program. The following text concentrates on just a few of the results produced by the terrestrial aspect of the EMMA program and related additional research projects. For a more comprehensive review, refer to Olsson et al. (2014).

Since the mountain area in Sweden is an important nature area, but has outdated map information, several EMMA projects tested the use of Lantmäteriet's 3D data for the mapping of mountain vegetation. It was shown that the relatively sparse point density laser data (ca. 1.4 points/m^{-2}) could be used to classify mountain birch (*Betula pubescens ssp. czerepanovii*) forest according to the FAO definition (Lindgren 2012). In addition, it was also of interest to estimate parameters such as above ground biomass (Fig.5). Nyström et al. (2012) estimated mountain birch biomass within a 10 m x 10 m grid cell size raster. They showed that mountain birch tree height and biomass could be estimated with a plot level RMSE of 9.5% and 21.2%, respectively, from Lantmäteriet's national laser scanning, while higher point density laser data (6.1 points/m^{-2}) produced only slightly better results (RMSE=8.8% and 18.7%, respectively). The same study was repeated using point cloud data created from photogrammetric matching of Lantmäteriet's digital aerial photographs rather than the airborne laser scanning (ALS) data. Using the photogrammetric point cloud (PPC) data, the RMSE for above ground biomass was 29.1% (Fig. 6; Nordkvist et al., 2014). It is significant to note that these techniques worked well despite the small tree size and irregular crown form of mountain birch forest.

To distinguish different vegetation types, beyond what can be achieved through analysis of 3D shapes, it is necessary to use spectral data from another source. Laser data and satellite images, for example from SPOT or Landsat, are two different data sources that complement each other excellently. This was shown to be true for mountain vegetation classification, where the addition of 3D laser data to SPOT data gave an improved classification (by approx. 20%) of willow, which is often difficult to map using only satellite data. It was also shown that adding information from the DEM (e.g., elevation, slope, wetness index) to satellite data can improve the classification accuracy significantly (Reese et al., 2014a). The same study was carried out using PPC data rather than ALS data, for a raster with 10 x 10 m grid cell size, showing that PPC data was just as useful as ALS data for classifying mountain birch forest, however, they did not contribute to the classification accuracy for other lower growing alpine vegetation classes as much as ALS data did (Reese et al., 2014b).

In addition to mountain areas, productive forest land areas were studied as well. The combination of satellite data and ALS data was tested for mapping of forest classes like those used for Lantmäteriet's GSD-Land and Vegetation cover map. By adding height percentiles from the ALS data together with SPOT satellite data, the ALS data improved the overall classification accuracy by about 10% (Nordkvist et al., 2012). It was shown from a previous study by Bohlin et al., (2012), that PPC data

could be used for standwise estimation of tree height (RMSE=8.8%), stem volume (RMSE= 13.1%) and basal area (RMSE= 14.9%), demonstrating accuracy levels comparable to those from ALS data. Nyström et al. (2013) studied the re-establishment of small trees into pasture land by using ALS data from two different time points, however with a higher point density laser data (ca 50 points/ m^{-2}). The ALS data from the two different time points were made comparable through histogram matching. This technique could be used to monitor the establishment of new trees in the tree-line, or for afforestation of grasslands.

In EMMA, it was also studied whether the laser data point clouds could be used for visual interpretation of natural variables (Skånes et al., 2011). The results showed that it was possible to visually interpret various structures such as bushes, boulders and lying dead wood. Interpretability depended on factors such as point density, canopy density of shrubs and trees, whether softwoods or hardwoods dominate, and the date (i.e., phenology) of the ALS data acquisition.
To summarize, there are now a number of new technologies that enable a more efficient and automatic mapping of vegetation, both for terrestrial and aquatic environments (Olsson et al. , 2014). These data include 3D data from laser scanning, spectral and 3D data from digital aerial photography, and satellite data. For the future, in addition to producing wall-to-wall maps, these data can also be the basis for sample-based surveys where sample areas could be followed over time, potentially useful for the monitoring of environmental changes.

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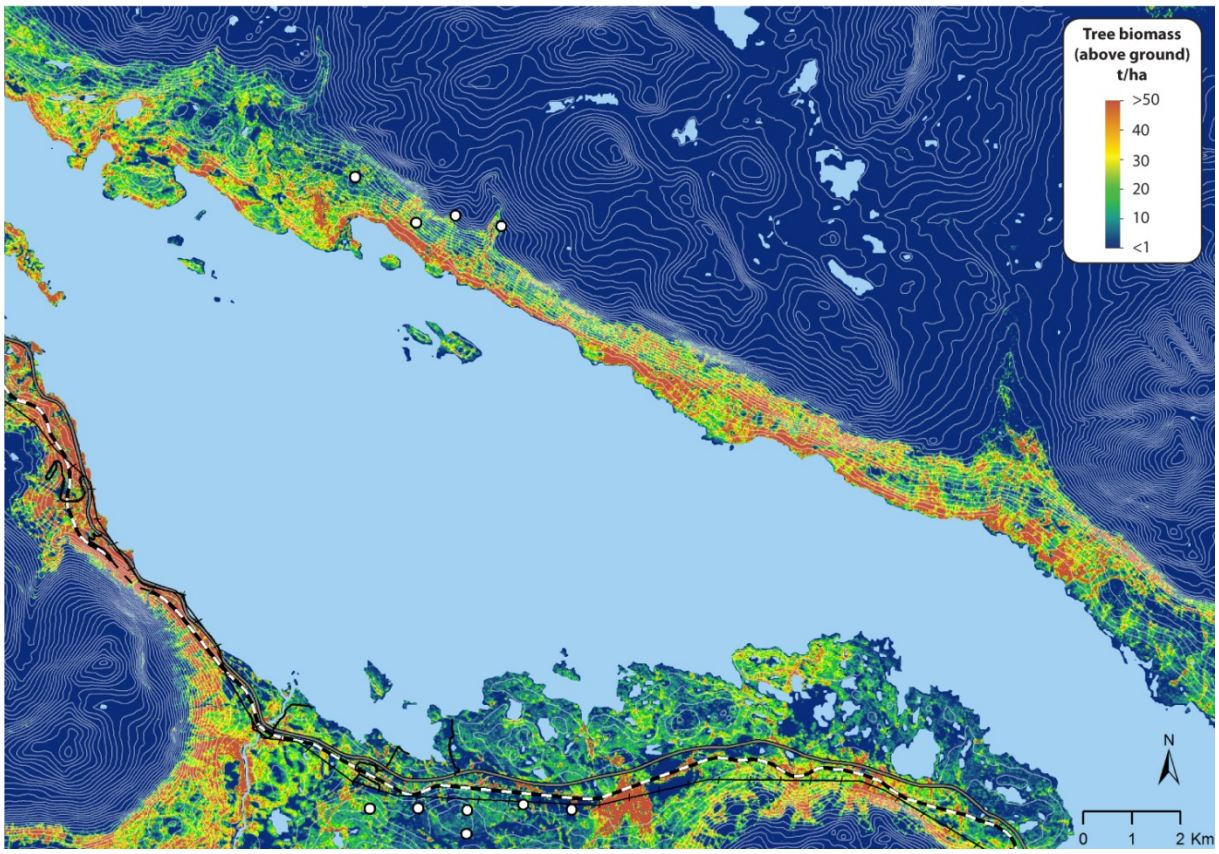


Figure 5: Estimation of mountain birch biomass around Lake Torneträsk near Abisko, Sweden, based on ALS data from Lantmäteriet and regression functions using field-measured reference plots.

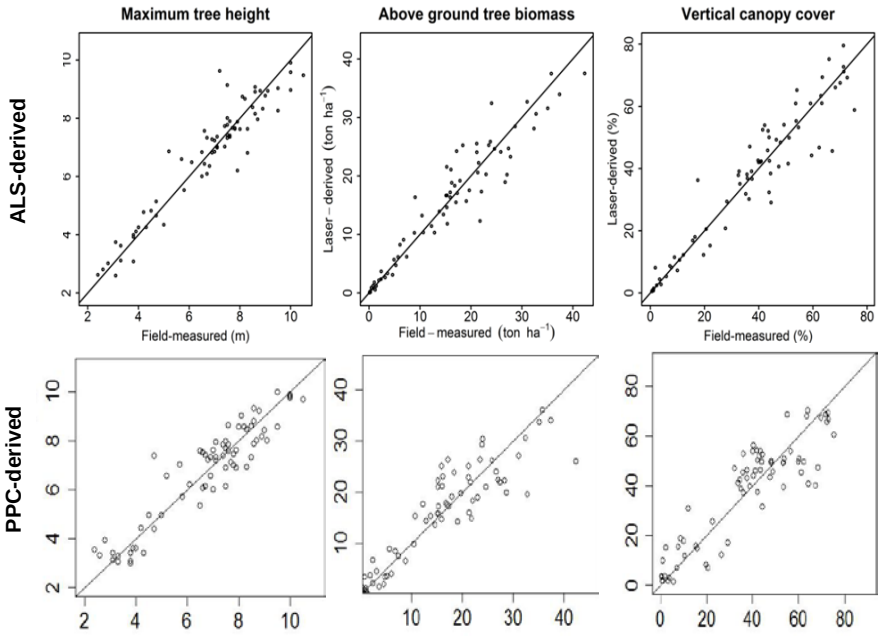


Figure 6: Estimation of mountain birch parameters using point cloud data derived from Lantmäteriets airborne laser scanning (ALS; top row from Nyström et al, 2012) and digital aerial photographs (PPC; bottom row from Nordkvist et al., 2014).

4. Report by Secretary-General Joep Crompvoets

2013: the second year that Anneke Heylen and myself were serving on the secretariat of EuroSDR. It was a year that we became more familiar with the EuroSDR-procedures, activities and people. This report reviews the annual meetings happening in the framework of EuroSDR in 2013, the activities related to our partner associations (e.g. AGILE, EuroGeographics, ICA, ISPRS, and OGC), out main publications, website and logistics.

4.1. Meetings

The 122nd Board of Delegates meeting took place in Copenhagen at the Søkvæsthuset from 29 until 31 May 2013. This meeting was hosted by the Danish Geodata Agency. It started with an overview of nice examples of GI research and professional activities in Denmark. The highlights of the meeting were the keynotes "Geographic Information and the Importance of Geographic Reference Data for Environmental Monitoring and associated Experiences at EU-level" by Jacqueline McGlade (who was the executive director of the European Environment Agency) and "Future of EuroSDR Commission 1" by the new EuroSDR Commission 1 chairman Fabio Remondino. Moreover, Thorben Hansen chaired an excellent and lively session about the EuroSDR Strategy Review. During this event , it was decided that Jon Arne Trollvik (Kartverket) takes over the chair of Commission 3 from André Streilein (Swisstopo), and that Jeremy Morley (University of Nottingham) takes over the chair of Commission 5 from Lars Bernard (Technical University of Dresden). The Danish host organized a wonderful evening with a nice cruise through the harbor of Copenhagen, followed by a gorgeous diner at the Admiral Hotel.

Figure 7: Group photo at Søkvæsthuset (30 May 2013)

Figure 8: Handover of the chairs of Commission 3 and 5

The 123rd Board of Delegates meeting took place in Gävle (Sweden) at the Lantmäteriet's head office from 23 until 25 October 2013. The host was Lantmäteriet. This meeting started with an overview of nice examples of GI research and professional activities in Sweden. A special session celebrating "60 Years anniversary of OEEPE" was organised. The pre-successor of EuroSDR, European Organization for Experimental Photogrammetric Research (OEEPE), was founded in 1953. This meant that the association existed 60 years. During this celebration event, invited presidents or chairmen of our partner organizations (Dave Lovell on behalf of EuroGeographics; Christian Heipke of ISPRS; Georg Gartner of ICA; Mark Reichardt of OGC; Mike Jackson of AGILE; and Samantha Lavender of EARSL) presented their organisation activities and their views to further cooperation with EuroSDR. Moreover, Prof. dr. Otto Kölbl and Chris Paresi gave an historic overview of the organisation and reviewed the scientific impact. Another highlight was the keynote of Jantien entitled the "Future of EuroSDR Commission 4". The Swedish delegates organised a delicious dinner in a wonderful setting of the Town Hall that was accompanied with great music and singing. At the end of the meeting, Dieter Fritsch (University of Stuttgart) stepped down as the Vice-President Research. André Streilein took over this position. EuroSDR acknowledged the positive contributions of Dieter Fritsch to the association.

Figure 9: Group photo at Lantmäteriet's head office (24 October 2013)

Figure 10: Farewell address of Dieter Fritsch (25 October 2013)

In preparation for these two Board of Delegates meetings the Executive Team met at the Ordnance Survey Ireland and University of Stuttgart.

4.2. Partnerships

In 2012, EuroSDR intensively cooperate with its partner organisations: Open Geospatial Consortium (OGC), International Cartographic Association (ICA), International Society for Photogrammetry and Remote Sensing, EuroGeographics, and Association of Geographic Information Laboratories in Europe (AGILE).

A Memorandum of Understanding with OGC was signed by the Presidents of both organisations, and an OGC-shared initiative on the interoperability experiment on 'Defining validating data quality requirements of CityGML' was launched
A Memorandum of Understanding between EuroSDR and (ICA) was signed at the opening session of the ICC Conference (Dresden, 26 August) as well as an EuroSDR session was organised at the same event. An ICA-book 'Abstracting geographic information in a data rich world: methodologies and applications of map generalisation' with contributions of several EuroSDR-members was published.

A Memorandum of Understanding between EuroSDR and ISPRS was signed at the Photogrammetric Week in Stuttgart (11 September).

The president and the secretary-general participated to the General Assembly of EuroGeographics (29 September – 2 October) including a presentation about EuroSDR. The 'GI+100' paper written by the EuroSDR Archiving Working Group was approved by the members of EuroGeographics. Moreover, there were several informal meetings with Dave Lovell and Ingrid Vanden Berghe to explore ways for further cooperation between EuroSDR and EuroGeographics.

A Memorandum of Understanding between EuroSDR and AGILE was signed during the '60 Year OEEPE anniversary' session. In addition, several joint pre-conference workshops at the AGILE 2014 Conference (Leuven, 14-17 April) were organised.

In addition, EuroSDR organised an EuroSDR session at the Geospatial World Forum (Rotterdam 13-16 May). Several members of EuroSDR contributed the RPAS Year Book 2013, and an oral presentation was given at the European RPAS Operators' Forum organized by UVS-International (Brussels, 9-11 December). Finally, EuroSDR financially supported the UAV-g Conference in Rostock (4-6 September).

Figure 11: A Memorandum of Understanding between EuroSDR and AGILE was signed by the president of AGILE, Mike Jackson, and president of EuroSDR, Thorben Hansen, to confirm the willingness of both associations to strengthen their collaboration (Gävle, 24 October 2013)

Figure 12: A Memorandum of Understanding between EuroSDR and ISPRS was signed at the PhoWo 2013 (Stuttgart, 11 September 2013)

4.3. Publication 2013

With support of BKG, the following papers were published:

Official Publication No. 62. (2013) contains the final reports of two EuroSDR projects: 1) Radiometric aspects of digital images, and 2) Mobile Mapping - Road Environment Mapping using Mobile Laser Scanning. Oude Honkavaara, E., Markelin, L., Arbiol, R., Martinez, L., 2013. **Radiometric Aspects of Digital Photogrammetric Images**. Kaartinen, H., Hyyppä, J., Kukko, A., Lehtomäki, M., Jaakkola, A., Vosselman, G., Elberink, S., Rutzinger, M., Pu, S., Vaaja, M., 2013. **Mobile Mapping - Road Environment Mapping using Mobile Laser Scanning.**

Official Publication No. 63. (2013) EuroSDR Workshop Proceedings 2nd High Density Image Matching for DSM Computation Workshop with Dieter Fritsch, Michael Franzen and Norbert as the editors

A Memorandum of Understanding between BKG and EuroSDR in regard to the preparing, printing and distributing of the series of Official EuroSDR Publication by BKG was ended. Unfortunately, BKG was no longer in the position to fulfill the voluntary tasks relating to the EuroSDR Office of Publications and to supply the yearly budget. EuroSDR is BKG grateful for the strong support given during the years.

A Memorandum of Understanding was signed between Thorben Hansen as the president of EuroSDR, and Michael Franzen as the representative of the Bundesamt für Eich- und Vermessumgswesen (BEV) during the Board of Delegates meetings 123. BEV and and EuroSDR agree in principle that the editing tasks for preparing the official EuroSDR publications will be covered by BEV. BEV will act as the EuroSDR Officer for Publications. EuroSDR is very grateful to BEV that it is taking this important initiative.

4.4. Website

With help of the website developer STATIK a new website was launched (http://www.eurosdr.net/).

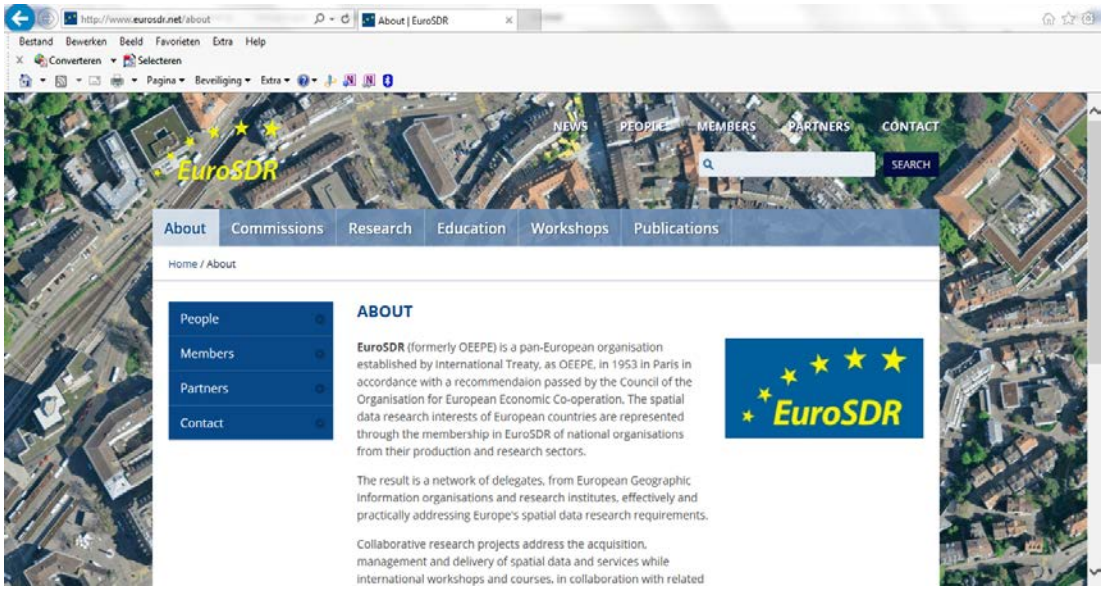


Figure 13: New EuroSDR website

4.5. Logistics

Regarding the associated logistics, the Secretariat was among others strongly involved in preparing the meetings, processing the meetings' minutes, decisions and actions, registering for EuroSDR events (e.g. workshops, EduServ), editing the annual report, financial accounting, auditing, sending e-newsletters, managing websites, etc.

After two years, we have the strong feeling that we are familiar with our secretarial tasks and look forward to cooperating with our members, chairs, president, vice-president, representatives of our partner associations and those that are simply interested in the activities of EuroSDR in the (near) future.

5. Commission I: Sensors, Primary Data Acquisition and Georeferencing
Fabio Remondino

The activities in 2013 related to Commission I were manifold:

- Participation and support in the 5th European Calibration and Orientation workshop (EuroCOW) in Castelldefels, Spain (February 2014): the workshop was held on 12-14 February and had approximately 60 participants. The main topics were automation in data processing, open calibration issues (for both cameras and laser scanners) and mobile mapping.

Figure 14: A session of the 2014's EuroCOW (left) and a typical dense point cloud from oblique aerial multi-camera system (right).

- Establishment of an on-going research activity on oblique aerial multi-camera systems (together with Markus Gerke, ITC/Twent University, The Netherlands): oblique cameras and imagery are a rediscovered technology, regarded in the photogrammetric community as one of the major developments in the field and a great source of geo-information. Oblique airborne multi-camera systems are becoming a standard sensor technology across a growing geospatial market, as complementary to the traditional vertical views and many NMCAs are critically observing the developments in this field. EuroSDR will prepare a questionnaire for hardware and software producers as well as for oblique imagery users to (i) highlight the potential of oblique camera systems for mapping and modelling purposes and (ii) collect technical details and information of oblique camera systems and related software. Some datasets will be also collected and processed in order to present to the BoD the potentialities of such multi-camera systems.

- Continuation of the UAV/RPAS activity in the field of national mapping (together with Goerres Grenzdörffer, Rostock University, Germany): the increasing importance of RPAS is nowadays obvious and it was demonstrated that also some NMCAs are using such platforms to collect useful geo-data for map update purposes. EuroSDR attended the 15th RPAS Civil Operations International Conference in Bruxelles (9-11 December) presenting its activity in the field of RPAS.

Figure 15: Norbert Haala and Fabio Remondino presenting at the RPAS – CivOp in Bruxelles, December 2013.

For 2014 the two aforementioned on-going activities will continue with more interesting results for the NMCAs and the entire research community.

6. Commission II: Image Analysis and Information Extraction
Norbert Pfeifer

Commission II
Image Analysis and Information Extraction

Commission II is concerned with the automatic extraction of geospatial information from airborne and satellite images but includes also dynamic acquisition from mobile, ground based systems for automatic reconstruction of façade information and urban furniture. Two finished projects could be published in 2013, two projects were finished, a workshop was held, and two new projects started.

The „EuroSDR project Benchmarking of Image Matching Approaches for DSM Computation" was finished with a workshop (60 participants) held in Vienna at the premises of the Federal Office of Surveying and Metrology (BEV) in Austria. The project was led by Norbert Haala of Stuttgart University, Michael Gruber from Vexcel Imaging (Microsoft Photogrammetry), and Wolfgang Stössel from the Landesvermessungsamt Bayern (surveying authority of the Federal State of Bavaria, Germany). A key element of this very successful project was the concentration on two scenes, one in rural areas (20cm GSD) and one in a city (10cm GSD). Both sites featured digital aerial image sequences with high overlap (length and side). Several flight missions were available and test participant (institutions, universities, companies) delivered digital surface models (DSM) computed from image matching, which were then compared. One problem encountered was the question for the reference surface, which was solved by concentrating on an inter-comparison between the applied approaches. Therefore, the reference was built as the DSM of median height of the supplied test results. It became apparent that surface models using different forms of cost based matching, which are in the meanwhile also implemented in commercial software, can provide dense point clouds which have a resolution close to the GSD of the utilized imagery. Shadowed areas are causing a higher variability within the results of different projects, and the sharpness of step edges differs between the approaches. A report of the closing workshop was available as EuroSDR report 63 and the final project report will appear in 2014.

The "Project Dense Image Matching – Follow Up" was started in 2013, it is under the guidance of Norbert Haala. It picks up the questions mentioned above.

The second new project in Commission II is the project "International benchmarking on TLS methods for forestry applications" carried out by Xinlian Liang and Juha Hyyppä from the Finish Geodetic Institute in Espoo. It concentrates on using terrestrial laser scanning as a data acquisition method to infer quantitative information in forest plots, e.g. number and parameters of trees. Data is planned to be provided to participants in 2014. This will include, next to TLS data also mobile laser scanning data and UAV (unmanned aerial vehicle) data. A motivation for this project lies in the need to obtain area wide coverage with quantitative information for forested areas. Plot-wise reference data is acquired at high resolution and this will be obtained from the mentioned measurement methods, augmenting and partly replacing manual field work.

The results of the project “Change Detection in high resolution land use/land cover geodatabases (at object level)” lead by Emilio Domenech (IGN Spain) are ready for publication. In this project a semi-automatic method was developed using aerial images and/or laser scanning data, including further the topological information between objects (e.g. building boundary polygons). With this method very reliably object classification and change detection are achieved.

Commission II projects were disseminated in three EduServ 11 courses: Radiometric calibration of aerial images and laser scanning (Eija Honkavaara, FGI and Christian Briese, TU Wien), High density image matching (Norbert Haala), and Integrated Use of Airborne Laser Scanning and Aerial Photogrammetry (Petri Rönnholm, Aalto University, Finland).

7. Commission III: Production Systems and Processes
Jon Arne Trollvik

I am honoured to give my first contribution to the annual report after being the new chair of Commission 3 from last fall. A number of projects, workshops and working groups document the vitality for Commission 3 in 2013. The activities were focussed on networking and capacity building in new fields of research such as crowd sourcing, change detection and archiving of digital reference data.

Crowd Sourcing for Updating National Databases
Based upon the results of the 1st EuroSDR Workshop on Crowd Sourcing for Updating National Databases, held at Swisstopo, Switzerland in 2009, a joint EuroSDR/AGILE project on *"the use of crowd-sourced data for up-date intelligence and meta-data enrichment of national mapping"* was started. The primary motivation of this project has been to investigate the scope for crowdsourced geospatial data and VGI to be used by National Mapping Agencies. A draft report of the first phase was delivered in October 2013, and the project will continue in 2014.

Two COST actions started in autumn 2012 are supported by EuroSDR, and they are both dealing with the issues of *crowd sourcing* and *volunteered geographic information*. **TD1202 (MACS - Mapping and the citizen sensor):** The main goal of this action is to enhance the value of citizen sensors in mapping applications, with a particular focus on map production and map evaluation. One of the next action items of this group is a survey of national and regional mapping agencies with respect to volunteered geographic information. It is expected that a majority of EuroSDR members will contribute to this survey.

IC 1203 (ENERGIC - European Network Exploring Research into Geospatial Information Crowdsourcing) deals with software and methodologies for harnessing geographic information from the crowd. The main objective of the Action is to build an open and flexible VGI European network of scholars, young researchers and industry representatives who will share their experiences in order to transform user generated information into exploitable data. The means foreseen will be: 1) develop common data mining software and methodologies that can exploit a wide range of VGI source (such as mapping efforts, photographs, social messaging, etc.) and can be applied in a variety of fields (environment, crisis management, advertising, tourism, etc.); 2) definition of quality assessment criteria (positioning, ontology, source identification, etc.); 3) establish an open and updatable repository of VGI analysis and integration tools and methods, literature and case studies; 4) develop cultural and contextual analysis methods of VGI that will help researchers in understanding the local aspects of VGI datasets and their use.

The EuroSDR **Archiving Working Group** utilises interdisciplinary experts from across Europe in discussion with geo-spatial stakeholders, to build a consensus on best practices and combined learning that is achieved through beneficial adoption and practical implementation of legislative obligations. Geo-spatial organisations across Europe face similar challenges in archiving data for public access. The output of the working group is a **policy paper on archiving of geo-spatial datasets** with an ordered list of principles. The revision process with EuroSDR, Eurogeographics and EBNA (European Board of National Archivists) is finished. The policy paper is ready for final approvement by the pan-european organisations. The Archiving Group is now looking at whether there is sufficient

synergy between the members to continue the shared learning by looking at some of the principles in more detail.

The **Working group on "Common goals and requirements for NMA's in change detection"** baselines the current state of automated change detection research and provides a stimulus for practical implementation of automated change detection methodologies. The position paper "**Goals and requirements of European National Mapping Organisations for change detection, *Findings of the EuroSDR Working Group on Common goals and requirements for NMAs in change detection***" is completed and accepted as an official EuroSDR position paper.

Working group on the **Preservation of the Geographical Production Process:** Geographic data has been subject to archiving in the form of maps for centuries. While the preservation of paper maps is well understood and put into practice, knowledge on the historical production process, and especially the pre-digital production process in the 20th century as it was practiced by many National Mapping Agencies (NMA), is now disappearing and has hardly been documented. The last witnesses of this era, people and objects, will be gone in just a few years. Hence, EuroSDR launched a working group on the Preservation of the Geographical Production Process. This initiative is also supported by EuroGeographics and the International Cartographic Association (ICA).
The first successful meeting was organized at the 21st and 22nd of May in Brussels at the National Geographic Institute. From this good start the Working Group is now in the phase of constituting themselves, in order to create a European platform and to propose a specific plan to preserve and open-up the knowledge on the geographical production process on a European scale from the last century(ies).

7.1. Project in the picture: EuroSDR Project Crowdsourcing and National Mapping Peter Mooney and Jeremy Morley

The co-funded AGILE and EuroSDR project on "Crowdsourcing and National Mapping" Phase 1 has been completed successfully. The final results and outputs from the project were reported to the EuroSDR BoD meeting in Gävle, Sweden, in October 2013. With the additional help of ESRI Europe this project was able to fund 5 internship projects which investigated specific questions on how crowdsourcing could be utilised by National Mapping Agencies. Each internship project was composed of the nominated funding partner, university partners, and industrial partners and National Mapping Agencies. The final rerpot for this project has now been prepared, submitted, and reviewed. It shall be published by EuroSDR in May 2014. We intend to distribute this report as widely as possible because we feel the results of the project and the partnerships involved are important to the current state-of-the-art and knowledge in the area of Crowdsourcing and it's usage in eGovernment and other government strategies. Pending the availability of finance from AGILE and EuroSDR it is anticipated that we will commence with Phase 2 of this project in Summer 2014.

Five projects were chosen from nine submissions. The projects were evaluated by external experts and the final decision was made by a selection committee. The following is a list of the five projects chosen. The title of the project, the academic PI, and the funding sponsor is outlined in the listing.

Project 1: Collection and visualization of alternative tourism sites and objects in Lithuania
National Participation: Lithuania
Academic PI: Dr. Giedrė Beconytė, Centre for Cartography of the Faculty of Natural Sciences at Vilnius University, Lithuania
Sponsor: EuroSDR (50%) and AGILE (50%)
SUMMARY: The project collected information on diverse sites and objects that are of interest to various groups of visitors but are not included in official information sources and do not belong to the tourist infrastructure network. The information was collected using crowdsourcing techniques. The system is working and can be developed further. The collected information will be periodically revised and published on the Lithuanian national SDI portal www.geoportal.lt.

Project 2: Incidental Crowdsourcing
National Participation: Spain, United Kingdom
Academic PI: Dr. Joaquín Huerta Universitat Jaume I of Castellón, Spain
Sponsor: ESRI Europe
SUMMARY: The aim of this project is the validation of a toponyms database provided by the Spanish Instituto Geográfico Nacional with 136.454 entities which haven't been validated yet. The project developed an application that applies Gamification techniques to encourage users to contribute their toponym validations while playing an online game. This novel approach of collecting data provided a mechanism to motivate users to revise names by turning a demanding and repetitive task into an engaging and enjoyable one.

Project 3: Ontology based Authoritative and Volunteered Geographic Information (VGI) integration
National Participation: Canada, Spain, The Netherlands
Academic PI: Prof. Rodolphe Devillers, Memorial University of Newfoundland, Canada
Sponsor: AGILE
SUMMARY: This project started with the idea of developing a method to handle semantic heterogeneity when integrating Volunteered Geographic Information (VGI) and authoritative datasets. The research showed that we needed to face semantic heterogeneities within VGI before trying to integrate it with other sources. Quantifying semantic heterogeneity in VGI will lead to better

decision making about the semantic quality of datasets for a specific purpose or application, and will thus lead to a better integration with authoritative datasets.

Project 4: Conflation of Crowdsourced Data
National Participation: Germany, United Kingdom
Academic PI: Dr. Volker Walter, Institut für Photogrammetrie, Universität Stuttgart, Germany
Sponsor: ESRI Europe
SUMMARY: Datasets of two test areas (Stuttgart and Calw) with a size of 2×2 km² were conflated with the two software packages. A comparison of the datasets shows that the data collection in inner-city areas is more detailed in OSM whereas the road network in rural areas is collected mostly similar in ATKIS and OSM. Both software systems were able to match the data. The main difference between the systems is that the ifp software needs manual input for the matching (which is very time intensive) whereas the 1Integrate software is fully automatic. This restricts the use of the ifp software to smaller areas.

Project 5: Characterising the use of vernacular placenames from crowd sourced data and a comparison with NMA Data
National Participation: Switzerland, France
Academic PI: Dr. Ross Purves, University of Zurich Switzerland
Sponsor: EuroSDR
SUMMARY: This work attempted to identify, extract and characterise the placenames people use as tags to depict their photos on Flickr using a simple approach based on tag frequency and user characteristics. Only about 1% of all extracted tags are official toponyms. Our analysis pointed to different reasons why those tags describe a location without being an official toponym and showed their potential to enrich gazetteers with more content.

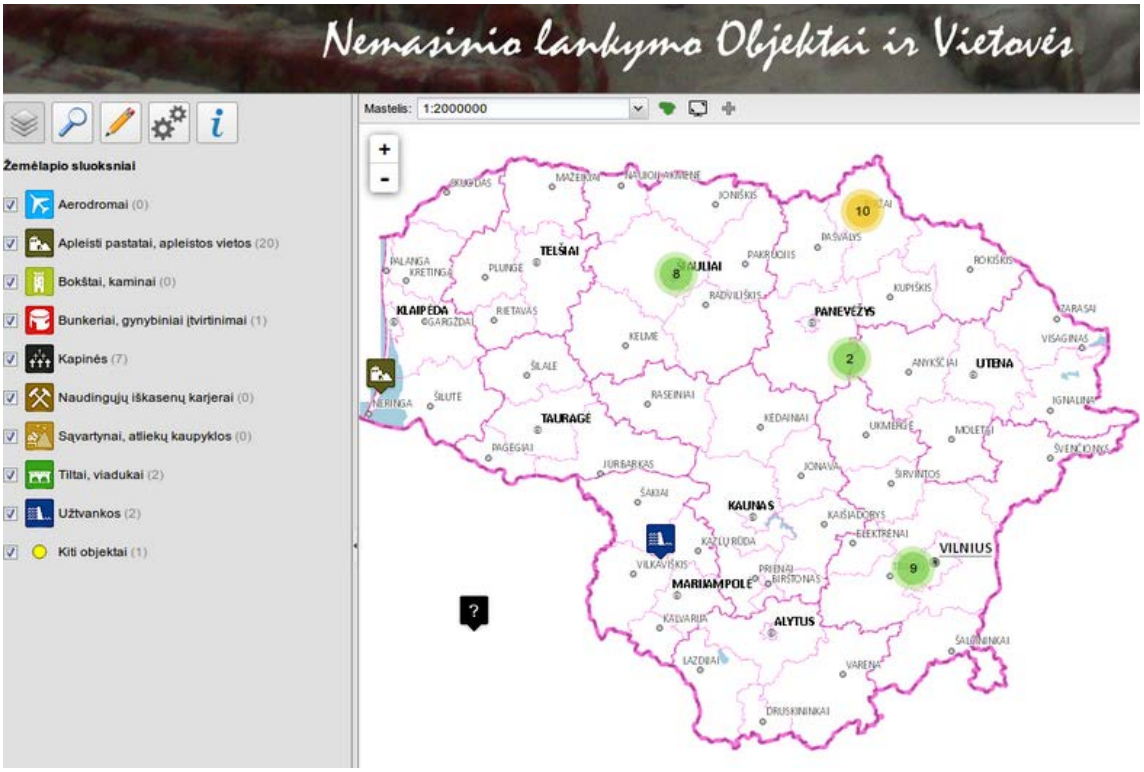


Figure 16:

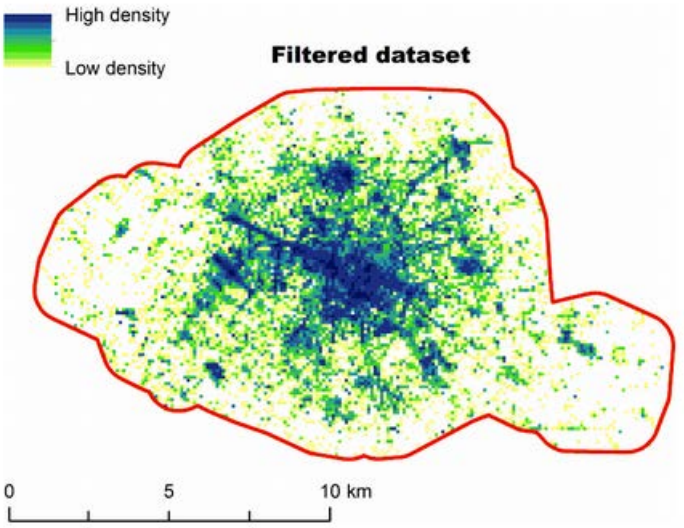


Figure 17: Filtered dataset

8. Commission IV: Data Specifications
Jantien Stoter

The mission of commission 4 is to facilitate appropriate use of large amounts of spatial data within geo-information infrastructure to solve spatially related problems. In 2013, several activities have been organised by this commission to contribute to this mission.

3D National mapping

For a long time, geo-data has been limited to two dimensions because on the one hand technologies were not available to handle more dimensions, and on the other hand because 2D modelling proved to be sufficient in earlier geo-applications. The growing awareness for our intensively used environment makes 3D information increasingly important in many applications.

The workshop "CityGML in National Mapping workshop" January 2013, IGN, Paris (organized by EuroSDR, OGC, Geonovum and IGN) focused on the challenges to obtain nation-wide 3D data models and to disseminate these within national geo-information environments (i.e. SDIs). The workshop outcomes were summarized in a paper for the international 3D symposium, November, Istanbul. The presentations and discussions showed that many NMCAs have made or are making the step towards 3D mapping, although several issues remain on how to generate appropriate 3D data in most effective manner, maintain it accordingly and use it in a wide variety of applications.

To address these issues, a special interest group on 3D (3D SIG) was established in autumn 2013. The aim of this group is to coordinate the long-term 3D research agenda of EuroSDR based on experiences and developments of both research institutes and NMAs in the area of 3D. Nine NMCAs further defined the scope of this EuroSDR 3D SIG as well as the accompanying action plan at a kick off meeting at Ordnance Survey, London, Dec 2013. The planned activities cover defining a common research plan, carrying out research projects on topics of common interest and organizing a workshop series on relevant topics. In addition a 3D standardisation working group will contribute to the relevant 3D standards and will study how 3D data models can be developed that lay down agreements on the definitions of 3D objects both at national and international level.

Automated generalisation

Automated generalisation has received a lot of research attention since digital maps became available and several NMCAs are introducing automated generalisation within their production line. In March 2013, EuroSDR and ICA jointly organised a workshop for mapping authorities to exchange experiences on multi-scale production lines including implementation of multi-representation databases and automated generalisation. The workshop was a success with 12 mapping organisations presenting their map production approaches. The presentations showed that many NMAs have introduced automated generalization within their production lines. Further research focuses on improving these automated processes as well as on developing generalisation solutions for on demand mapping, since nowadays spatial data is more often displayed as dynamic information on screens than as static information on paper maps. The commission will continue to work on this topic.

EuroSDR/ICA/ISPRS Workshop on Web cartography

On May 14th 2013, EuroSDR organised a Workshop on Web cartography for National SDIs in conjunction with the AGILE conference on Geographic Information Science, 14-17 May 2013, Leuven, Belgium. The aim of the workshop was to identify requirements and solutions today of handling

cartographic aspects in Web services as well as to agree on open research issues. An extensive report of this workshop has been included elsewhere in this annual report.

INSPIRE KEN and EuroSDR Workshop on Schema Transformation

The INSPIRE KEN-network (Knowledge Exchange Network) together with the EuroSDR Commission 4 organised a workshop about schema transformation tools and methods. The workshop took place in France on 8th and 9th of October. NMCAs, as other data producers, will have to make their data compliant with INSPIRE interoperability Implementing Rules. During the next years, this compliance will be achieved through schema and data transformation. The presentations of the participants all together provided an overview on the state-of-play about schema transformation tools to help NMCAs to assess these tools and to identify issues that need further development. The workshop results can be found at: http://www.eurogeographics.org/content/inspire-ken-eurosdr-workshop

8.1. Workshop in the picture: Web Cartography for National SDIs – EuroSDR workshop held at Agile 2013

Barend Köbben, University of Twente, Lars Harrie Lund University, Jantien Stoter, Delft University of Technology & Kadaster

Today, huge amounts of geo-information are being distributed via the Internet. This has many advantages for the users as well as the producers of this data, because it has become easier to deliver up-to-data information, to combine data from different sources, to enable collaborative mapping, to hyperlink between geodata and other information and even to facilitate more personalised maps. But what are the *cartographic issues* related to the *combination* of different web services?

To address these issues, the 14th of May 2013, the first day of the annual AGILE conference on Geographic Information Science (in Leuven, Belgium) a workshop was organized titled "Web Cartography for National SDIs". The aim was obtain a better understanding of the requirements and solutions of handling cartographic aspects in Web services, to identify the needs for further research and developments within this field, and to develop ideas on how to organise and strengthen the necessary research and development activities.
About 30 participants joined the workshop, 14 from National Mapping agencies, 11 from academia and research institutes and 4 from industry. They listened to a couple of invited keynote speakers, and six presentations that had been selected by a review committee from the extended abstracts received.

Figure 18: The "Groot Begijnhof" in Leuven, the scenic venue for the workshop.

The EuroSDR perspective
The workshop was organised under the auspices of EuroSDR (Commission 4 Data Specification), together with the ISPRS (WG II/2 - Multiscale n-dimensional Spatial Data Representations, Data Structures and Algorithms), and the ICA (Commission on Maps and the Internet).
The cartographic issues of displaying geo-information on the Web are of growing interest of NMCAs because nowadays geo-information is much more often used in a web environment than on a traditional map. Displaying the data in a dynamic environment provides new possibilities, such as integration with data from others and serving on-demand maps. This gives other challenges for the cartographic appearance.

The workshop presentations

The opening session started with a keynote by Sebastien Mustière, who introduced the main research issues at IGN France and the COGIT Lab. He presented the work undertaken to automatically derive up-to-date vector maps from vector geographic databases. He argued that the personalization of web maps that users are expecting nowadays, leads to a great need for research into flexible adaptation of legends and symbolization, according to culture, handicap or taste of the map users.

The second keynote was delivered by Lars Harrie, of Lund University (Sweden). He discussed methods to improve the cartography in view services as well as an ongoing project, which looks into standardization of web cartography in Sweden.

In the second session the focus was on web services for visualisation at various scales. Paul Hardy (of ESRI inc., USA) concentrated on the design of multi-scale basemaps in ArcGIS, for use with overlaid operational layers, including the tiered scale data models and consistent cartography for maps that show content from whole nations down to single buildings. He explained how contextual abstraction tools can be used to produce intermediate scale bands, and provided examples of basemap services, their cartography, and their use for vivid communication in story maps.

Mikael Johansson described how Lantmäteriet, the NMA of Sweden, has developed Web Map (Tile) Services to provide a base map, using a workflow including ArcGIS and MapServer. He also mentioned the efforts to provide INSPIRE compliant services and highlighted the problems in providing proper text placement when the annotations in the underlying geographical model are not related to the objects they represent.

The INSPIRE angle was further explored in the session on “Tools for Webmapping”, in a talk by Julien Gaffuri (Joint Research Centre, Italy). He provided an overview of how visualisation aspects are already addressed in INSPIRE and what possible next steps could be. One such step he proposed was the creation of a register, listing and describing all INSPIRE styles. This register would act as a cartographic legend for all INSPIRE view services.

Next, Edward Mac Gillavry (WebMapper, The Netherlands) reported about the tools that have been developed in order to facilitate the adoption and wide-spread use of the Dutch National Spatial Data Infrastructure. Besides simply providing geographic data sets through web services that comply with the OGC recommendations, an all-purpose online base map has been developed together with a full-fledged geographic application, the “GEOZET” viewer. To reach out to casual users, a wizard was developed to add simple, yet interactive, maps to web pages, as well as a plugin for the Open Source GIS software QGIS. Edward also presented the Dutch “Guidelines for Web Cartography”, aiming at web developers without cartographic background, and meant to be a template for an implementation-independent formulation of cartographic visualisation rules.

Figure 19: Geozet viewer

The final presentation session on “Visualisation of NMA maps on the web” featured two talks by national mapping agencies. First, Jean-Christophe Guélat showed how swisstopo (Switzerland) is publishing swissTLM-Map, a raster version of its large-scale 3D topographical landscape model. The publication workflow consists of symbolizing vector data in ArcMap and exporting raster data as geoTIFF using a custom command tool, and finally publishing the service using MapServer. One sixth of Switzerland is updated each year, thus allowing swisstopo to reach its up-to-dateness requirements (i.e. once every six years).

Lastly, Frédérique Spitaels of NGI Belgium described the CartoWeb project, which dealt with the design and implementation of the production and publishing process of the CartoWeb product. This is a cartographic representation of the Belgium geographical base data, adapted for onscreen display. As such it is a new, attractive and less expensive, alternative for the traditional cartographic products. It is offered in 11 scale levels, ranging from 1:4 million to 1:2,500. One new feature is the possibility of using ortho-photos as a backdrop to the larger scale maps.

Group Discussions and Results

The last hours of the workshop were reserved for a series of group discussions. The first discussion subject was “visualisation of overlaying map layers from disparate web map services”, and focused on the actual cartographic challenges, the use of cartographic rules and the need for and possibilities of implementation of guidelines for Web Cartography. The main findings were that there are still considerable problems when overlaying a varying set of map layers from disparate data sources. The unpredictability of the combinations chosen by the users, combined with the inflexibilty of the symbolisation of the layers, leads often to inconsistencies, confusing symbolisation and legends and other problems. Especially the balance between background layers and thematic foreground is difficult to optimise. The participants saw several approaches to solve these problems: Limitation of themes and content was mentioned, and also the use of more versatile (background) layer symbology. For the latter, multi-resolution and especially vector technology was often suggested.

The second discussion focused on the subject “towards intelligent automated web mapping from NMA/SDI data: what tools do we have, what are we missing...?” and its main topic was the availability and usability of modeling and software *tools* to create high quality web map services. The

general consensus seemed to be that the current tools offer solutions for many of our challenges, with the possible exception of good support for Styled Layer Descriptors. Especially the lack of easy to use SLD editors was mentioned. Developments in the near future, especially the growing use of web maps on mobile devices, is expected to lead to the need for support of vector tiles.
With a focus more on research subjects such as knowledge, models and metadata, the topic of the third discussion was “towards intelligent automated web mapping from NMA/SDI data: challenges for research”. Here the main findings were that there is a need for uniform solutions to portray meta data, and that there is a clear shift from raster to vector technology. Furthermore, general discussions of the right balance between client-and server-tasks were raised, and it was agreed that on several terrains we lack proper mechanisms to evaluate quality. Examples given were the quality of dynamic generalisation, of automatic labeling, of usability of end-user applications, and more general of web mapping standards: How can we measure if a map is “good enough” for our users?
In the final plenary discussion there was agreement that overall, an emerging key subject seems to be the use of vector technologies replacing the more traditional raster (tile) mapping paradigm.

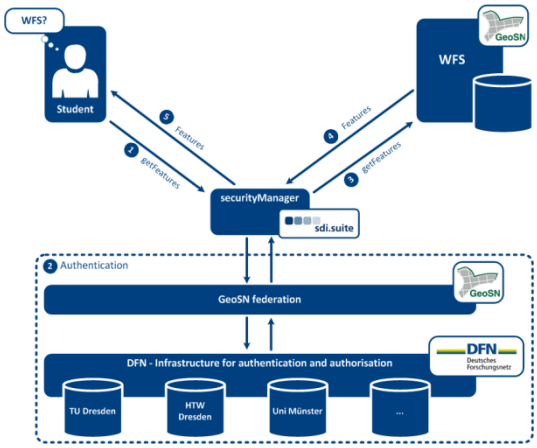
The presentations and extended abstracts can be found on the workshop website at http://kartoweb.itc.nl/WebCarto13/

Figure 20: Picture of workshop

9. Commission V: Network Services
André Streilein

Commission 5 (Network Services) deals with the developments in the technologies for the integration and delivery of all forms of geoinformation, including information derived from imagery. Major themes are the impact of the Internet and Web services, and related technologies such as XML, the shift to service-based architectures and the use of object models for information. As this domain evolves very rapidly, there has been a substantial amount of activities of Commission 5 in the year 2013.

The **AGILE/EuroSDR/OGC Persistent Testbed Initiative (PTB)** is currently running in its third phase. The joint project provide students with access to protected spatial data sets from authorities by authenticating with their regular university logins advanced. The access federation infrastructure was set up at Technische Universität Dresden, including the required software provided by con terra GmbH and a few sample data sets provided by GeoSN (responsible authority for the INSPIRE implementation in Saxony). The configuration and the access to the German national university access federation DFN-AAI is yet missing and work in progress. Once this link is successfully established, further NMA data sets e.g. from the BKG and the Bavarian SDI will be connected during PTB Phase 3. The Bavarian SDI and the German BKG are currently exploring possible international usage scenarios for their developed access concept. The Czech German/ Saxonian project CROSS-DATA and the EU FP7 funded project COBWEB may serve as a first candidates. Within the development of this initiative it was suggested to rethink the PTB concept. As real Spatial Data Infrastructures are already established and operational there is no longer a need for an SDI sandbox. Hence the focus has changed towards a series of 'Network service hackatons' to explore prototype, test and potentially establish new techniques and implementations.



With respect to volunteered geographic information, phase 1 of the co-funded **AGILE and EuroSDR project on "Crowdsourcing and National Mapping"** has been completed successfully. The final results and outputs from the project were reported to the EuroSDR BoD meeting in Gävle, Sweden, in October 2013. With the additional help of ESRI Europe this project was able to fund 5 internship projects which investigated specific questions on how crowdsourcing could be utilised by National Mapping Agencies. Each internship project was composed of the nominated funding partner, university partners, and industrial partners and National Mapping Agencies. The final report has been written and distributed. The report will be made publicly and openly available. In terms of physical indicators, the important outcomes are the workshop, final report, several published project papers acknowledging AGILE and EuroSDR. In terms of value-added indicators of success, the project can be considered as very successful from NMCA point of view generating ideas and concepts which academia researched, showing the potential of crowdsourcing/VGI when NMCA has control/input in the process. Finally, the project provided lots of scope to develop the ideas further and build on this momentum.

The second phase of the EuroSDR/AGILE project 'Crowdsourcing and National Mapping' deals with the following set of research topics:

- What are the key sources of Volunteered Geographic Information (VGI) and how do they complement each other?
- How can these sources of VGI be successfully combined?
- How do we the improve/measure their quality?
- Are we (EuroSDR/NMCAs, AGILE, academics) simply passive absorbers of VGI or should/how can we become more active and get more people/groups/organisations involved?
- What use cases of these sources of VGI can we develop which could be tested/trialed on a practical basis by NMCA?
- What are the key factors in successful VGI project work?

The Commission also prepared a **series of Workshops related to Network Services**. A first workshop on distributed geoprocessing gets currently proposed as a joint EuroSDR/AGILE workshop to be held at the AGILE 2014 conference in June 2014 (3 June, Castellon, Spain). This workshop 'Geoprocessing in the Web' will centre on the current status of standards, implementations and application scenarios for distributed geoprocessing (WPS, Cloud, service orchestration, etc). A second workshop focuses on 'How to Hackaton' (Nottingham, 17-18 December 2013) in order to clarify the best practices for Hackatons and the role of Hackatons in (organizational) development. And finally the commission intends to organize a workshop on Geoportal Usability.

In the near future the commission intensives their work in the domains of 3D data, Linked Data and 3D GIS / BIM interoperability.

10. Intercommission Working Group on Standards
Wolfgang Kresse

The report for 2013 is an update of the previous of last year. This Intercommission Working Group on Standards focuses on the development of international standards for photogrammetry and remote sensing, on monitoring the whole suite of ISO/TC 211 standards with their relevance for EuroSDR, and on seeking cooperation with new standardization activities.

The ISO/TS 19159-1 “Calibration and validation of remote sensing imagery sensors – Part 1: Optical sensors” has passed the votes and is now about to be published. It should be mentioned that the foundation of this standard was laid by the EuroSDR-Project on Digital Camera Calibration.

All standards for geographic information published by the ISO/TC 211 contain a UML-model as their core part, mostly a set of class diagrams. In order to convert the abstract standard to the implementation level, the ISO/TC 211 recommends the Java archive (JAR) ShapeChange for the schema transformation from UML to XML Schema. In the case of the ISO/TS 19159-1 this free package has been applied to derive an XML Schema out of the UML model. An implementation-level programming interface is to be completed soon.

The project of developing calibration standards was continued with the ISO/TS 19159-2 regarding airborne lidar. The related document has also been completed and is now advanced towards the formal voting process, beginning with the Committee Draft.

In addition, the Working Group is active in all ISO/TC 211 standardization projects of the Working Group 6 “Imagery” such as the imagery metadata (ISO 19115-2), the georeference of geospatial imagery and sensors (ISO/TS 19130-1 for optical sensors and ISO/TS 19130-2 for lidar, radar, and sonar), and as a fairly new topic, the encoding rules for imagery and gridded data (ISO/TS 19163).

11. Intercommission Working Group on Education
Markéta Potůčková

The Educational Service (EduServ) of EuroSDR continued with its 11th series. Four two-week e-learning courses focused mainly on newest developments in photogrammetry and laser scanning were offered:

- Radiometric performance of Digital Photogrammetric Cameras and Laser Scanners
  Tutors: E. Honkavaara and L. Markelin (Finnish Geodetic Institute), C. Briese and N. Pfeifer (TU Vienna)
- Open Standards & Open Source WebMapping
  Tutors: B. Köbben, I. Ivanova (ITC University of Twente)
- High density image matching
  Tutor: N. Haala (University of Stuttgart)
- Integrated use of airborne laser scanning and aerial photogrammetry
  Tutor: P. Rönnholm (Aalto University)

A pre-course seminar was hosted by Fabio Crosilla at the International Centre for Mechanical Sciences (CISM), Udine, Italy from 11th to 12t^{h} March 2013. In total 35 participants coming from national mapping agencies (52%), research institutes and academia (37%) and private industry (11%) registered to EduServ11. There were 16 to 25 attendees per course. Based on the received feedback,

most of them found the courses useful and expressed their interest to continue with such a type of lifelong learning. EduServ12 is going to start in March 2014.

The first version of EduServ guidelines for tutors and hosts of the pre-course seminar was disseminated during the 122nd BoD meeting in Copenhagen. Instructions on using Moodle will be added in 2014.

A white paper on "Future of EduServ" was introduced by Dieter Fritsch and it was approved by 123rd BoD meeting in Gävle. It summarises the last ten years of EduServ. It also gives an overview on new technologies that shall become a standard in EuroSDR e-learning courses within one or two years. Based on recommendations of the white paper an EduServ Advisory Board has been established. It should guarantee continuity of EduServ as well as high quality and attractiveness of its courses.

12. Workshops

- CityGML (Paris, 21-22 January 2013)
- EuroSDR/ICA Generalisation (Casteldefells)
- Web Cartography for NSDI (Leuven, 14 May 2013)
- GWF 3D The Next Challenge of NMAs (Rotterdam, 16 May 2013)
- Mapping Heritage (21-22 May 2013)
- High Density Image Matching (Vienna, 13-14 June 2013)
- Pre-conference workshop of ICC 2013 'Generalisation and Multi-Scale Representation' (Dresden, 23-24 August)
- VGI-sessions at ICC 2013 (Dresden, 26 August)
- UAV-g (Rostock, 4-6 September 2013)
- INSPIRE KEN - Tools for Schema Transformation (Paris, 8-9 October)
- Kick-off EuroSDR Special Interest Group on 3D (Southampton, 12-13 December)
- 'Importance of geographical information for archivist (Brussels, 25 November)

13. Publications

All recent publications can be ordered or downloaded from our website.

63. Fritsch, D., Pfeifer, N. & Franzen, M., 2013. Proceedings of the second EuroSDR workshop on **'High Density Image Matching for DSM Computation'** held from 13th to 14th June 2013 in Vienna, Austria

62. Honkavaara, E., Markelin, L., Arbiol, R., Martinez, L., 2013. **Radiometric Aspects of Digital Photogrammetric Images**
Kaartinen, H., Hyyppä, J., Kukko, A., Lehtomäki, M., Jaakkola, A., Vosselman, G., Elberink, S., Rutzinger, M., Pu, S., Vaaja, M., 2013. **Mobile Mapping - Road Environment Mapping using Mobile Laser Scanning**
Report of EuroSDR projects, 101 pages. Frankfurt a.M. 2013

61. Fritsch, D., Pfeifer, N. & Franzen, M., 2012. Proceedings of the EuroSDR workshop on **'High Density Image Matching for DSM Computation'** held from 16th to 17th January 2012 in Vienna, Austria

60. Höhle, J. & Potuckova, M., 2011. **Assessment of the Quality of Digital Terrain Models**
Report of EuroSDR project, 85 pages. Frankfurt a.M. 2011

59. Ronholm, P., 2011. **Registration Quality - Towards Integration of Laser Scanning and Photogrammetry**
Vanden Berghe, I., Crompvoets, J., de Vries, W. & Stoter, J., 2011. **Atlas of INSPIRE Implementation Methods**
Report of EuroSDR projects, 298 pages. Frankfurt a.M. 2011

58. Stoter, J., 2010. **State-of-the-Art of Automated Generalisation in Commercial Software**
Grenzdörffer, G., 2010. **Medium Format Cameras**
Report of EuroSDR projects, 270 pages. Frankfurt a.M. 2010

57. Streilein, A. & Kellenberger, T. (eds.), 2010. Proceedings of the EuroSDR Workshop '**Crowd Sourcing for Updating National Databases**' held from 20th to 21st August 2009 in Wabern, Switzerland.
Colomina, I., Skaloud, J. & Cramer, M. (eds.), 2010. Proceedings of the joint EuroSDR/ISPRS '**International Calibration and Orientation Workshop EuroCOW 2010**' held from 10th to 12th February 2010 in Castelldefels, Spain.
Nebiker, S., Bleisch, S. & Gülch, E. (eds.), 2010. Final Report of the EuroSDR Project '**Virtual Globes**'. Frankfurt a.M. 2008.

56. Champion, N., 2009. **Detection of Unregistered Buildings for Updating 2D Databases**
Everaerts, J., 2009. **NEWPLATFORMS - Unconventional Platforms (Unmanned Aircraft Systems) for Remote Sensing** 102 pages. Frankfurt a.M. 2009.

55. Cramer, M., 2009. **Digital Camera Calibration** - report of EuroSDR project. 262 pages. Frankfurt a.M. 2009.

EuroSDR is a pan-European organisation established by International Treaty, as OEEPE, in 1953 in Paris in accordance with a recommendation passed by the Council of the Organisation for European Economic Co-operation. The spatial data research interests of European Countries are represented through the membership in EuroSDR of national organisations from their prodcution and research sectors.

The result is a network of delegates, from European Geographic Information organisations and research institutes, effectively and practically addressing Europe's spatial data research requirements.

Collaborative research projects address the aquisition, management and delivery of spatial data and services while international workshops and courses, in collaboration with related organisations, address key issues in a timely and focussed manner.

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