

# Annual Report 2014

## 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 production 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 acquisition, 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.

## Vision

EuroSDR is the recognised provider of research-based knowledge to a Europe where citizens can readily benefit from geographic information. Our mission is to develop and improve methods, systems and standards for the acquisition, processing, production, maintenance, management, visualization, and dissemination of geographic reference data in support of applications and service delivery.

## Our Member States and their Prime Delegates (2014)

<b>Austria</b>	Michael Franzen	Bundesamt für Eich- und Vermessungswesen (BEV)
<b>Belgium</b>	Ingrid Vanden Berghe	Nationaal Geografisch Instituut
<b>Cyprus</b>	Andreas Sokratous	Department of Lands and Surveys
<b>Denmark</b>	Thorben Hansen	Geodatastyrelsen
<b>Finland</b>	Juha Hyypää	Geodeettinen Laitos
<b>France</b>	Bénédicte Bucher	Institut Géographique National
<b>Germany</b>	Hansjörg Kutterer	Bundesamt für Kartographie und Geodäsie
<b>Ireland</b>	Andy McGill	Ordnance Survey Ireland
<b>Italy</b>	Fabio Crosilla	University of Udine
<b>Norway</b>	Jon Arne Trollvik	Statens Kartverk
<b>Poland</b>	Piotr Woźniak	Główny Geodeta Kraju
<b>Slovenia</b>	Dalibor Radovan	Geodetski Institut Slovenije
<b>Spain</b>	Antonio Arozarena	Instituto Geografico Nacional
<b>Sweden</b>	Mikael Lilje	Lantmäteriet
<b>Switzerland</b>	François Golay	Ecole polytechnique fédérale de Lausanne (EPFL)
<b>The Netherlands</b>	Jantien Stoter	Technical University of Delft and NL Kadaster
<b>United Kingdom</b>	Malcolm Havercroft	Ordnance Survey of Great Britain



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## 1. Message from the President Martin Salzmann



Spatial information is on the agenda. 2015 will be the international year of the map. In the Netherlands 2015 has been declared the year of the spatial domain. Numerous domains in society are becoming aware that many of their issues have a spatial component. As our English colleagues say: 'place matters'. Looking at e.g. mobility, smart cities, sustainable food and energy production, spatial information and spatial inference can help us to come up with better solutions. As a spatial community we have reached a point where we can collect, combine and analyse spatial information on a scale and currentness that we have never witnessed before. The work we have done as EuroSDR in the past decades gives us a unique opportunity to contribute to the use of spatial information.

In 2014 we could welcome two new members to EuroSDR: Poland and Slovenia, both having a strong tradition in spatial data research. They are an asset to our community.

In 2014 we have continued to advance our body of knowledge on spatial techniques and have witnessed applications of new technologies. We have worked on data gathering and sensors. A fine example is the work on terrestrial and airborne laser scanning. It is not just the collection of data that matters, but also its quality control, classification and fusion with other data sources. The same holds for the use of satellite data in more remote areas and high resolution (oblique) imagery including techniques for image matching. In the application domain we have instituted a successful 3D special interest group. Moreover we have also started to explore new methodologies to structure and use data. A nice example is our first tentative explorations in linked data.

In the application domain the combined use of different data sources and the increasing amount of data pose new challenges and possibilities at the same time. This has resulted in our research on procedures to properly archive data and results, and gives a boost to standardisation. Handling and combining the enormous amounts of data in a meaningful sense is a challenge we face in our entire industry and with our users. It is not only about combining information, but also about sharing resources and teaming up with other professional parties as we already do with ISPRS and AGILE.

We are moving so quickly ahead that we would almost forget our former working procedures and products. Understanding our historic data is crucial in processes where change over time is part of the analysis that is needed. Luckily we also have members that make this data useable and accessible for the future.

This year we have intensified our cooperation with other societies in our domain. We have continued to shape our relationship with EuroGeographics. We were invited to host one of their round table discussions at their general assembly in Chisinau on innovation. At the same time, we have stimulated the cooperation between our commissions and the knowledge exchange networks (KENs) of EuroGeographics. First experiences have been made in the field of emergency mapping. As I write this message the workshop on spatial data and map quality is held in Malta. In 2015 we will further form, strengthen and formalise this cooperation.

October 1, 2014 UN-GGIM: Europe has been established. As a professional association we have been granted observer status. UN-GGIM focuses on supporting the millennium development goals of the UN by using the potential of spatial information. Being an UN-institution member states are the actual members, but in practice these are often represented by their national mapping authority which in

turn are our members. UN-GGIM: Europe will first focus on putting the use of spatial data on the political agenda, look at core datasets required and the integration of datasets and information. This last subject is one of our areas of expertise.

At both international meetings, I sensed a strong need for outreach and (technical) capacity building. The ongoing developments in technology and information society force our industry to keep up to date at an increasing pace. At EuroSDR apart from research (where we create or apply knowledge), we have always put much effort in knowledge exchange. Part of our assets are our workshops and courses we organize. They are acknowledged as extremely useful and providing 'value for money'. Outreach is and will be one of our core competences and contribution to our members.

Our outgoing president Thorben Brigsted Hansen with the help of the members of the executive team has laid the foundations for a new strategy of EuroSDR taking into account all developments sketched above. Elements of this strategy have been discussed at our Board of Delegates Meetings in Apeldoorn and Leuven and the end result will provide us the basis and direction from which we will operate. These discussions have also resulted in reconsidering our commission structure. The key discussion is if we do the right things and also if we do them in the right way. This resulted in a very animated exchange of ideas at the Leuven Board of Delegates Meeting and we plan to decide on our strategy and commission structure at our next Board of Delegates meeting in Tønsberg.

I began this article with stating that we live in a time of spatial data and inference. That is true worldwide, certainly in our densely populated Europe, and provides us with an environment where we can make a difference with the research and development we are doing.

First of all I want to thank our delegates from academia and mapping organisations for actively advancing our research and sharing their ideas within the EuroSDR community and beyond. They are doing the work supported by Joep Crompvoets as secretary-general, Anneke Heylen in the secretariat in Leuven, André Streilein as vice-president guiding the research agenda, Fabio Remondino, Norbert Pfeifer, Jon Arne Trollvik, Jantien Stoter, and until spring Jeremy Morley as commissions chairs and Wolfgang Kresse and Markéta Potůčková as chairs of the intercommissions. Last but not least I want to thank Thorben Brigsted Hansen who handed over to me a thriving EuroSDR-community committed to research and development.

## 2. Message from the Vice-President André Streilein



2014 was an intense and prosperous year for EuroSDR. The organisation became noticeable through many practical achievements in an increasing heterogeneous and complex research environment. And it took a break to make an evaluation about its current situation in a fast technologically changing environment and the expectation of its stakeholders. This process results in a vision “EuroSDR is the recognised provider of research-based knowledge to a Europe where citizens can readily benefit from geographic information”.

And sub-sequentially in a new mission: “To develop and improve methods, systems and standards for the acquisition, processing, production, maintenance, management, visualization, and dissemination of geographic reference data in support of applications and service delivery.”

It is characteristic for this organisation, that the improvements are achieved by common tests, workshops, cooperation with partner organisations, and the exchange of experiences with other organisations. The main research activities of EuroSDR in this year dealt 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,
- increasing focus on data integration and quality issues and
- historical data and processes.

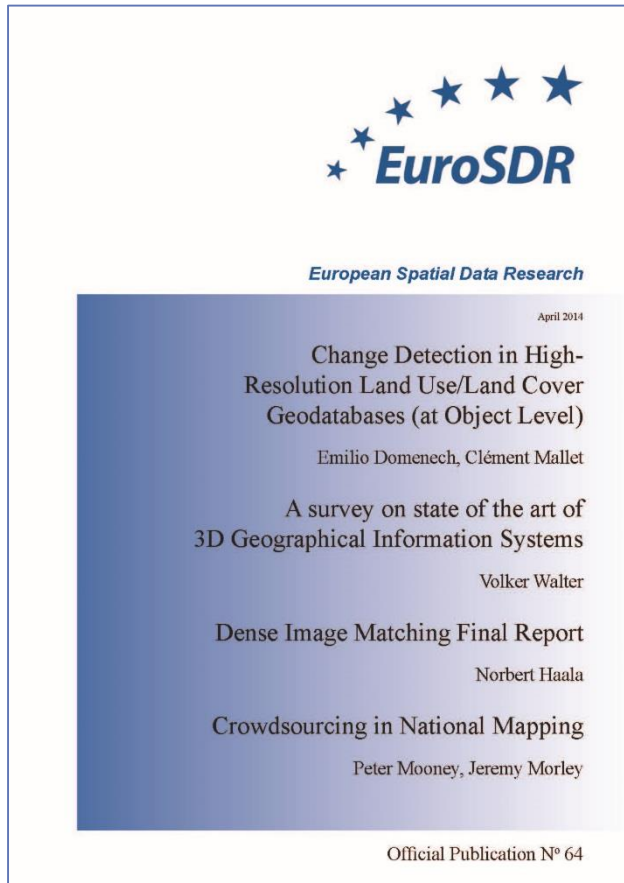
Many projects have been finalized and new projects have been launched, often based on the open tackled questions from workshops or Board of Delegates Meetings. For example the project on dense image matching has been finalised and a follow on action has been generated. The working group on Archiving has finalised their task with the publication of the 16 EuroSDR principles for the long term preservation of digital Geographic Information, whereas new activities have been launched with a new Working Group on Preservation of the Geographic Production Process and a new initiative on historic data. Projects on RPAS (remotely piloted aerial systems) for the data acquisition run as well as project on the use of different sensor types like oblique aerial imagery. With the upcoming potential and challenges of 3D geographic information, in terms of data acquisition, data maintenance and applications deals with a new formed "EuroSDR Special Interest Group on 3D (3D SIG)". It already considers the question of the economic benefit of 3D data and information. Furthermore projects on crowd sourcing and the determination of the potential of linked data are running.

Many of the activities, exchange of ideas and opinions, generation of new ideas and projects are performed in workshops. It is typical for EuroSDR workshops that these take place as joint events together with other relevant scientific organisation. To mention just a few: EuroCOW, the European Calibration and Orientation Workshop, February 2014 in Castelldefels, Spain, together with ISPRS; Preparations for Sentinel 2 in Europe, November 2014 in Oslo, Norway, together with Norway Digital and the Norwegian Space Centre; or the EuroSDR/ISPRS workshop 'Efficient capturing of 3D objects at a national level: with a focus on buildings and infrastructure', November 2014, Southampton, UK.

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 12th series of the Educational Service was running in 2014 and consisted of the following courses: “Integrated use of airborne laser scanning and



aerial photogrammetry” tutored by Petri Rönholm (Aalto University, Finland), “High density image matching” tutored by Norbert Haala (Stuttgart University, Germany), “Mapping using high-resolution satellite imagery” tutored by Daniela Poli (Terra Messflug GmbH, Austria) and” Change detection in High-Resolution land use/cover geodatabases (at object level)” tutored by Clément Mallet (IGN France). A total of 39 attendees actively participated in the e-learning part of the educational service. Their feedback was very positive regarding the content, structure and course materials.



In addition the Official Publication No. 64 was released in 2014. This publication contains the reports of the finalized EuroSDR projects 'Change detection of Benchmark of Image Matching', 'Change detection in High Resolution Land Use/Cover Geodatabases', 'Crowdsourcing and National Mapping', and a survey on 'The art of 3D Geographical Information Systems'

Figure 1: Frontpage of the Official Publication No. 64

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

#### 3.1. THE NETHERLANDS: The reconstruction of a nationwide 3D virtual model of The Netherlands Jantien Stoter, Kadaster

In 2014, the Kadaster has led a project to reconstruct a nationwide 3D virtual model of the Netherlands from a 2D object oriented database at 1:10k (TOP10NL) and high resolution Lidar data (AHN). The project - a collaboration between Dutch Kadaster, Universities of Delft and Twente, Geodan and Con terra - adopted open source 3D mapping tools, originally built for project based processing, and transformed them into a workflow suitable for nationwide processing. The reconstruction process uses the semantics of the 2D database. The Lidar data has been filtered into ground points, which are assigned to the map polygons with classes 'terrain', 'water' and 'roads', and non-ground points, which are used to reconstruct 3D 'building' blocks from 2D polygons. Heights are calculated at both the surfaces and the boundaries of every terrain object (i.e. roads, water, land use). At every 5 meter on each boundary between two topographic objects, the height is calculated based on local laser points and the semantic rules given by the class of the neighbouring polygons. For the 3D reconstruction of multi-level crossings, the Kadaster has developed a specific algorithm that also makes use of semantics encoded in the 2D data.

The workflow consists of three stages: data preparation, 3D reconstruction, and post processing. Within and between every stage, adaptations to "project based settings" were needed in order to process a nationwide dataset. Examples of these adaptations in the preparation stage are the subdivision of extremely large water polygons in open water bodies and efficient storage solutions for transferring data from one stage to the other.

The 3D reconstruction stage has the longest processing time and was therefore done tile-by-tile of 1x1 km. An additional step was needed to produce a seamless 3D model across tiles. A supercomputer has been used to perform the parallel processing of 30.000 tiles, in total transforming 15 Million polygons using over 100 Billion laser points. On average each tile takes 1 hour of processing on 1 CPU. The processing was done on 112 parallel CPU's.

The countrywide 3D model of the Netherlands is available as open data and will be further developed based on feedback of the users. The 3D model can be used in a wide variety of applications, i.e. from noise and air quality modelling to shadow analysis (see Figure 2) and heat island calculation.

Kadaster has started experiments to generate and apply point clouds and DSM in the process of updating the 3D national topographical dataset. As part of this experiment, a DSM is created using SURE software on a high-resolution aerial image data set. The quality of the created DSM was evaluated using the national Lidar dataset. The points clouds and DSM are also used to evaluate the usability for change detection. In these experiments e-Cognition software is used.



Figure 2: 3D model application for shadow analysis



#### **What is NVALUTA?**

NVALUTA is a free mobile application that enables users to browse through real-estate market data. The application is developed for smart phones and tablet computers. Location-based services include valuation of typical real estate and search for recent transactions at the location of the user or within a certain radius. Basic residential and commercial real-estate categories are supported, i.e. houses, apartments and offices.

#### **Who are the users of NVALUTA?**

Everyone who wants to find information about real estate values, i.e. homeowners, home buyers, home sellers, renters, real estate agents, investors, mortgages professionals and property managers.

#### **What are the core features of NVALUTA for users?**

- **FAST, EASY & FREE ACCESS:** users can access and view detailed information about transactions (date, achieved selling price, size and location of the property) and get informative value per square meter of property in reference to the location of the user;
- **LOCATE & NAVIGATE:** users can see the location of property on a map and display the distance and direction to the property, which was the subject of transaction;
- **SEARCH "ON THE FIELD":** users can use the augmented reality - expanded view of the physical world enriched with geo-referenced transactions and investigate properties while on the field.

#### **Which devices support NVALUTA?**

Smart phones and tablet computers with one of the following operating systems:

- Apple iOS 5+,
- Google Android ICS 4+,
- Microsoft Windows Phone 8+.

#### **Where can I download NVALUTA?**

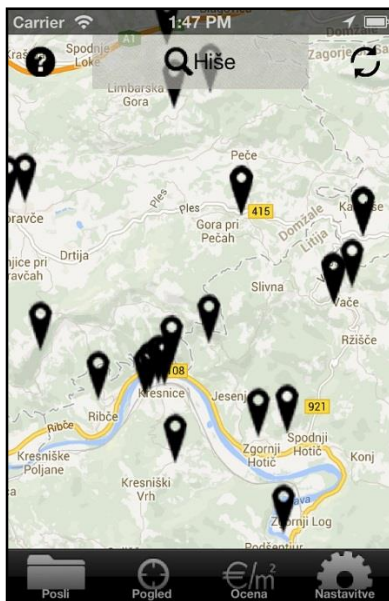
You can download the application for free from the App Store, the Google play and Windows Store.

#### **What are the positive impacts of NVALUTA?**

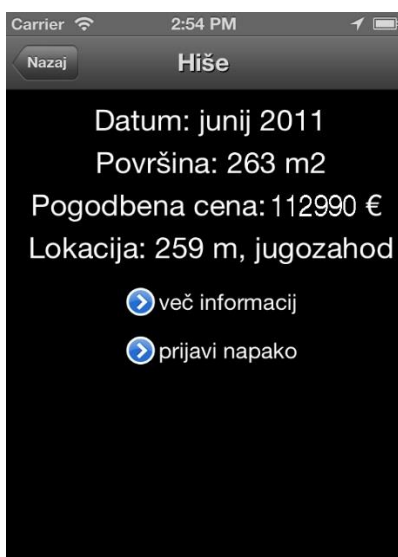
- Increased transparency of Slovenian real-estate market.
- Greater possibility to detect anomalies on the market and to prevent market speculations.
- Influence on the reduction of price volatility and spatial price dispersion.
- Helping potential buyers and sellers to conduct the business.
- Encouraging residential mobility and thus flexibility on the labour market and greater utilization of the housing stock.

#### **Who is developing NVALUTA?**

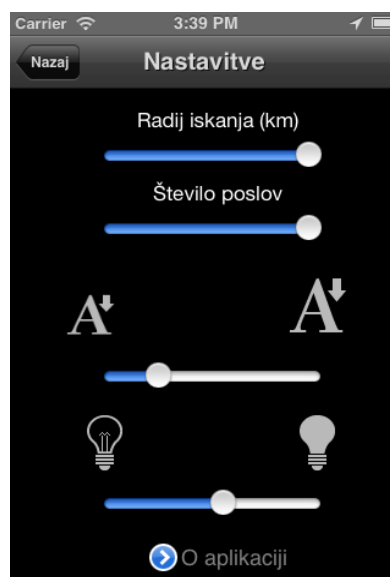
NVALUTA was developed by the Geodetic Institute of Slovenia in cooperation with the University of Maribor, Faculty of electrical engineering and computer science and Media Atlas, supported and financed by the Ministry of education, science and sport within the European Regional Development Found.



Map of  
transactions  
&  
Augmented  
reality



Sales  
data  
&  
Average  
price



Data  
records  
&  
Settings  
options

Figure 3: nValuta applications

**SLOVENIA: Comparative analysis of the national surveying public service in Slovenia with other countries and strategy for the period 2012-2025**  
 Dalibor Radovan, Geodetic Institute Slovenia

University of Ljubljana, Faculty of Civil and Geodetic Engineering (UL FGG) is the leading project partner with the close cooperation of the Surveying and Mapping Authority of the Republic of Slovenia (SMA RS) and Geodetic Institute of Slovenia (GIS). The project started in 2014 and will finish in 2015. The spatial data infrastructure and the system of land administration are one of the key public infrastructures. Due to the fast technological developments as well as new organizational models for public services the present organization and activities of the SMA RS has to be critically analysed in order to develop a new strategy for the next ten years.

First, a thorough analysis of organization and concept models in the selected European countries has been accomplished. In addition, the existing legal framework has been examined and a review of international trends in particular segments of the professions has been prepared (for basic geodetic system, topography and cartography, and land administration system). The methodology has been proposed, including: analysis of the circumstances (the mission, consideration of other interest groups and their expectations, cost/benefit analysis, thinking of different scenarios), recognition of basic strategic dilemmas, topics and trends, setting the strategic goals, developing a plan and strategic projects as well as defining indicators for evaluation the accomplishment of the plan. We used the strategic matrix, composed of four aspects (Figure 4): (1) internal capacities (staff), (2) internal business processes, (3) user's aspects (value for users and participants), (4) supervision and finances.

VIZIJA:						
POSLANSTVO:						
Kako ustvarjamo vrednost za naše uporabnike (odjemalce) in deležnike?	REZULTATI					
	VIDIKI	4	FINANCE, SKRB ZA JAVNI INTERES			
		3	VREDNOST ZA UPORABNIKE in DELEŽNIKE			
		2	NOTRANJI POSLOVNI PROCESI (Geodetska uprava RS)			
		1	NOTRANJE KAPACITETE, ZAPOSLENI (Geodetska uprava RS)			
	STRATEŠKE TEME					
VREDNOTE						

Figure 4: Strategic matrix

We have already organized a few workshops with different target participants to get the valuable considerations, ideas and also subjective opinions on the present situation. We plan to further collect data with a web questionnaire for all the employees of the SMA RS, prepare some open discussions for the wider professional public.

SLOVENIA: UAV/RPAS in education at UL FGG  
Dalibor Radovan, Geodetic Institute Slovenia

A group of enthusiastic students of the Master program of Geodsy and Geoinformatics at the University of Ljubljana, Faculty of Civil and Geodetic Engineering (UL FGG) has built their own quadrocopter named “FlyEye” for collecting spatial data from images, within the activities of the Slovenian Students of Geodesy Association. Building an UAV from scratch presented a big challenge and great opportunity for the students to learn about this modern technology. With the support of their tutors (professors and assistants from the faculty) the students already tested the system in different projects (<http://www.dsgsflyeye.com/>) and got promising results. Presentations of the system for the public have been organized and there was a lot of interest from the media (TV, newspapers, internet media) to report on this. The system is available for research, use in lab lessons and educational purposes in subjects of photogrammetry and remote sensing at the faculty.



Figure 5: Building the quadrocopter from the purchased components  
([http://www.geodetski-vestnik.com/58/3/gv58-3\\_dougan.pdf](http://www.geodetski-vestnik.com/58/3/gv58-3_dougan.pdf))



Figure 6: Final UAV named FlyEye ([http://www.geodetski-vestnik.com/58/3/gv58-3\\_dougan.pdf](http://www.geodetski-vestnik.com/58/3/gv58-3_dougan.pdf))

As already reported by some NMCAs from other countries, they use such platforms to collect useful geo-data for map update purposes (EuroSDR, Annual Report 2013). Thus this could be a further challenge for cooperation of UL FGG and Surveying and Mapping Authority of the Republic of Slovenia in this topic.



### 3.3. SWEDEN: GET: a web-based service for downloading free geodata for Swedish universities Heather Reese, Lantmäteriet

Researchers at the Swedish University of Agricultural Sciences (SLU) have developed a web-based download service for geodata called “GET” (Geodata Extraction Tool). This web service makes it possible for staff and students from 27 Swedish universities and colleges to download free geodata for research and educational purposes.

The background to GET’s development was that the previous geodata distribution service, the Digital Map Library from Lantmäteriet (the Swedish mapping, cadastral and land registration authority), was closed down in December 2011. To replace this service, SLU decided to develop its own internal web-based geodata distribution service, GET. This service was noticed by other universities, and after several requests, GET was expanded for use by all Swedish universities and colleges. This expansion meant that GET opened up to 400,000 potential users. The requirement for a university to have access to GET is that it should be connected to SWAMID (Swedish Academic Identity) and that the university signs a licensing agreement with Lantmäteriet.

SLU is responsible for the development, operation and support of GET. One of the main sources of funding currently comes from the Swedish Research Council, which contributes approximately 425.000 € per year from 2014-2016. This money finances development work, costs of operation and support, as well as license fees to the authorities that contribute geodata.

Today GET distributes geodata from four Swedish authorities. All in all, 15 TB of geodata are currently available from the service. Some examples of the data layers available are listed below.

- Lantmäteriet provides many of their geodata products, including orthophotos, laser data, elevation models, land cover maps, and other geodata in both vector and raster formats.
- The Geological Survey of Sweden (SGU) provides data on bedrock, groundwater, geophysics, geochemistry and soil types.
- The Swedish Maritime Administration provides marine charts in both raster and vector formats.
- Statistics Sweden (SCB) provides geodata on urban areas, incomes, vacation homes, and population statistics.

One of the goals of GET is that users should experience it as being intuitive and simple. The first page users see, is a map of Sweden from which the user selects an area of interest (Figure 7). The user can then choose the desired geodata map layers which are then cookie-cut to the area of interest. Within minutes the user receives an email with a link for downloading the data to their own computer.

The service is well used. Since GET’s inception in September 2012, more than 140.000 downloads have been made and the current rate is about 1.500 downloads a week. The data layer which is the most popular to download is Lantmäteriet’s orthophotos, real estate maps and digital elevation model with a 2 m grid cell size which was generated from airborne laser scanning. The three universities who use the service the most are SLU, Uppsala University and the University of Gothenburg.

In the coming years GET will become an even more stable infrastructure, mainly through doubling the number of servers. The system developers are also working on better queue management which is needed when several people want to download large amounts of data at the same time. Another planned development is to use open source software to an even greater extent. GET will also be integrated into Sweden’s national geodata infrastructure. GET has been developed and administered by Mats Högstöm, Jakob Lagerstedt and Göran Adelsköld of SLU.

## More information

- Geodata Extraction Tool (GET): [maps.slu.se/get](http://maps.slu.se/get) (download available for Swedish universities only)
- Sweden's national geodata infrastructure: [www.geodata.se/en](http://www.geodata.se/en)
- Lantmäteriet: [www.lantmateriet.se/en](http://www.lantmateriet.se/en)
- Geological Survey of Sweden: [www.sgu.se/en](http://www.sgu.se/en)
- Maritime Administration: [www.sjofartsverket.se/en](http://www.sjofartsverket.se/en)
- Statistics Sweden: [www.scb.se/en](http://www.scb.se/en)

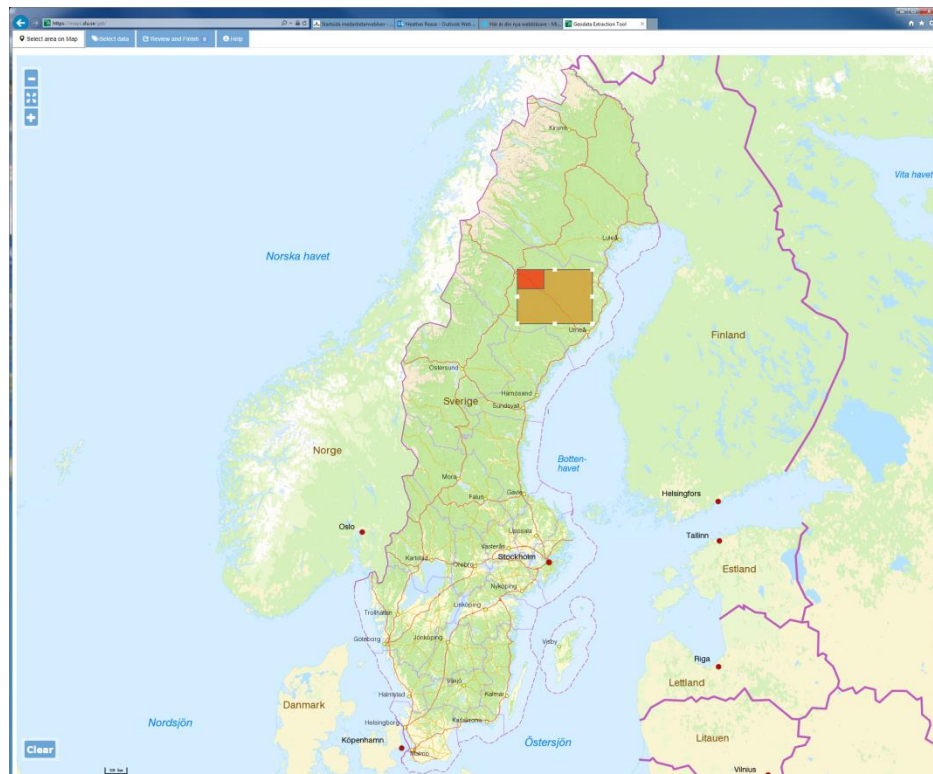


Figure 7: The interface to GET.

The rectangle shows the area the user has chosen for download of geodata.



## 4. Report by Secretary-General Joep Cromptvoets



2014: Already the third year that Anneke Heylen and myself are serving on the secretariat of EuroSDR. It was a year that we finally became familiar with the EuroSDR-procedures, activities and people. During this year, I also received support of Anne-Marie Reynaers. This report reviews the annual meetings happening in the framework of EuroSDR in 2014, the activities related to our partner associations, our main publications, website and some logistics.

### 4.1. Meetings

The 124th EuroSDR Board of Delegates meeting took place in Apeldoorn (The Netherlands) from 14 until 16 May 2014. This meeting was hosted by the Kadaster – the Dutch national mapping, cadastre and land registration agency. It started with an overview of nice examples of GI research and professional activities in The Netherlands. During this event, the delegates approved the candidacy of Poland to become full member of EuroSDR with Piotr Woźniak (Head Office of Geodesy and Cartography) as the prime delegate. The highlights of the meeting were the three keynote presentations: 1) “Status of Airborne Oblique Imaging” by Markus Gerke (Twente University); 2) Linked Open Data & “The Linked Open Data Project of The Netherlands” by Erwin Folmer (University Twente, TNO, Geonovum); and 3) “Future of EuroSDR Commission 3 – What’s happening in Norway” by the new EuroSDR Commission 3 chairman Jon-Arne Trollvik (Kartverket). An important highlight for EuroSDR was also the approval of the EuroSDR Strategy documents with clear vision/mission statements, strategic objectives, governance structure, and actions by the delegates. At the end of the meeting Thorben Hansen of the Danish Geodata Agency stepped down as the President of EuroSDR. EuroSDR is very grateful for all what Thorben has done for our organization. The Dutch host organized an unforgettable evening at the Royal Palace “Het Loo” including a gorgeous diner.

The 125th EuroSDR Board of Delegates meeting took place at the University Hall of KU Leuven and the Leuven Institute for Ireland in Europe (Belgium) from 22 until 24 October 2014. This meeting was hosted by the National Geographic Institute – Belgium (with Ingrid Vanden Berghe as the host). The meeting started with an overview of relevant innovations in the domain of Geographical Information achieved by public authorities, academia, and industry in Belgium. The highlights of the meeting were the two keynote presentations: 1) “Introduction to UVS International” by Peter Van Blyenburgh. UVS-International is a non-profit association representing manufacturers of remotely piloted systems (RPS), related subsystems and critical components and associated equipment, as well as companies supplying services with or for RPS, research organisations and academia; and 2) “The Role of Geospatial Data for Good Governance” by Prof. dr. Geert Bouckaert (KU Leuven – Public Governance Institute). Other important highlights for EuroSDR were the discussion about the new Commission Structure being part of the EuroSDR Rolling Research Plan 2015-2018 as well as the new Slovenian membership with Dalibor Radovan (Geodetic Institute of Slovenia) as the prime delegate. One evening, the Belgian delegates organised a visit to the exhibitions ‘Vesalius’ and ‘Markus Schinwald’ at Museum M followed by a wonderful dinner hosted by Dirk Van Speybroeck (VITO). EuroSDR is very grateful to the Belgian delegates for organising such a great event.



Figure 8: Group photo at Kadaster, Apeldoorn, The Netherlands (15 May 2014)



Figure 9: Group photo at the Leuven Institute for Ireland in Europe, Leuven, Belgium (23 October 2014)

In preparation for these two Board of Delegates meetings the Executive Team met at the Bruno Kessler Foundation (27-28 February, Trento, Italy) and Geonovum (4-5 September, Amersfoort, The Netherlands).



Figure 10: Welcome address of the new president Martin Salzmänn (Kadaster, The Netherlands)

## 4.2. Partnerships

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

EuroSDR participated to an OGC-shared initiative, on the Interoperability experiment on 'Defining an validating data quality requirements of CityGML and several meetings were organised with OGC-staff to explore possibilities for further cooperation.

EuroSDR organized a joint EuroSDR/ISPRS session about sensors at the Geospatial World Forum in Geneva, Switzerland (9 May 2014). Moreover, it also organized another joint EuroSDR/ISPRS session about the integration of different types of oblique imagery at the ISPRS TC I Mid-term symposium 2014 (17-20 November 2014, Denver, USA).

The president of EuroSDR signed a Memorandum of Understanding with UVS-International in order to strengthen the collaboration between the two associations. EuroSDR contributed to the 2014 RPAS Yearbook and to the RPAS Civil Operations event (2-4 December 2014, Brussels). The chair of UVS-International, Peter van Blyenburgh, gave a keynote at the 125th Board of Delegates meeting in Leuven.

The new president and myself participated to the General Assembly of EuroGeographics (Chisinau, Moldova, 28 - 30 September). The introduction to the EuroGeographics Roundtable on the Impact of new technology for NMCAs took place under the umbrella of EuroSDR. EuroSDR contributed to the EuroGeographics KEN Emergency Management Workshop focusing on UAV and Mapping (29 April 2014, Brussels). Moreover, there were several informal meetings with Ingrid Vanden Berghe and Dave Lovell, respectively the president and executive director of EuroGeographics, to explore ways for further cooperation between EuroSDR and EuroGeographics.

EuroSDR co-organised an EuroSDR/AGILE workshop 'Geoprocessing on the Web' as a pre-conference workshop on AGILE 2014 (3 June 2014, Castellón de la Plana, Spain). At the 125th Board of Delegates meeting, the president of AGILE, Lars Bernard, presented ways to strengthen the collaboration between the two associations.

The EuroSDR president and myself attended the first meeting of United Nation initiative on Global Geospatial Information Management Europe (UN-GGIM Europe) in Chisinau, Moldova (1 October 2014). During this event, EuroSDR received the status of Observer.



#### 4.3. Publication 2014

With support of Bundesamt für Eich und Vermessungswesen, the following report was published:

The Official Publication No. 64. (April 2014) contains the final reports of two EuroSDR projects:

- Change Detection in High-Resolution Land Use/Land Cover Geodatabases (at Object Level) with Emilio Domenech (National Geographic Institute – Spain) and Clément Mallet (National Geographic Institute – France) as the authors.
- A Survey on state of the art of 3D Geographical Information Systems with Volkert Walter (University of Stuttgart) as the author.
- Benchmark on Image Matching with Norbert Haala (University of Stuttgart) as the author.
- Crowdsourcing in National Mapping with Peter Mooney (National University of Ireland Maynooth) and Jeremy Morley (The University of Nottingham) as the authors .

#### 4.4. Website

With help of the website developer STATIK a new website was officially launched 28 February 2014 (<http://www.eurosd.net/>). The figure presented below shows a screenshot of the EuroSDR website.

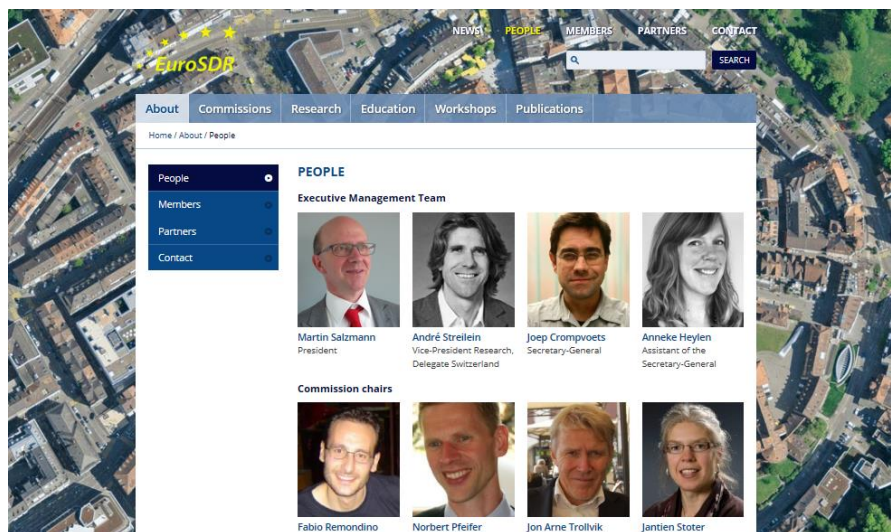


Figure 11: New EuroSDR website (People side)

#### 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.

On behalf of the Secretariat, I would like to express that we look forward to continue 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**



In 2014 Commission I has been primarily involved in the oblique imagery activity. Oblique aerial 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. Some NMCA are critically observing the developments in this field or running internal tests. For these reasons a questionnaire and a test field have been realized. The questionnaire on oblique imagery, distributed to end users as well as hardware and software producers, highlighted the potential of oblique camera systems for mapping and modelling purposes and collect technical details and information of oblique camera systems and related software.

A summary of the results were published in the GIM Magazine, Vol. 28(12). The test field and benchmark activity was realized in collaboration with ISPRS, collecting also UAV imagery and terrestrial data (images, laser scanning point clouds and GCPs) to exploit the intrinsic advantages of each dataset, develop novel fusion methodologies and perform accuracy analyses.

Commission I has also followed the latest developments in the Remotely Piloted Aircraft Systems (RPAS) field. The increasing importance of RPAS is nowadays obvious and also some NMCA are starting to use such platforms to collect useful geo-data for map update purposes. EuroSDR contributed in the RPAS Annual Book (12th edition) reporting the different NMCA activities with RPAS platforms.

### Attended events in 2014

- 5th European Calibration and Orientation workshop (EuroCOW), 12-14 February, Castelldefels (Spain): the workshop had approximately 60 participants and was co-sponsored by EuroSDR. The main topics were automation in data processing, open calibration issues (for cameras and laser scanners) and mobile mapping.
- UVS- International RPAS 2014 conference, 23-26 June, Brussels: EuroSDR presented some activities of NMCA with RPAS platforms.
- Commercial UAV show, 21-22 October, London (UK): EuroSDR presented a talk “A critical review of a technology in transition”. The event was the largest global gathering of commercial UAV users with more than 1000 visitors.
- ISPRS Commission I Symposium, 17-21 November 2014, Denver (USA): EuroSDR organized a special session where the on-going activities on “Oblique imagery” and “Dense Image Matching” were presented and discussed.
- RPAS Civil Operations International Conference, 2-4 December, Brussels: EuroSDR presented the RPAS potentials in the field of mapping in front of the EU officers.

## 6. Commission II: Image Analysis and Information Extraction

### Norbert Pfeifer



Commission II is concerned with the automatic extraction of geospatial information from airborne and satellite images but includes also acquisition from mobile or static ground based systems for automatic reconstruction of 3D information on the man-made and natural environment. In 2014 successful Commission II projects were further disseminated in EuroSDR EduServ courses, and two projects were running. No project reports were published in 2014.

In EduServ 12, held at Bruno Kessler Foundation, Trento (Italy) the outcome of Commission II projects were disseminated by project leaders.

- Petri Rönholm from Aalto University (Finland) presented the “Integrated use of airborne laser scanning and aerial photogrammetry”, which was based on the EuroSDR benchmark project “Registration quality – towards integration of laser scanning and photogrammetry”. The course however, went beyond this project and also discussed integrated use of airborne laser scanning and aerial imagery for object-level integration, highlighting the benefits of integrated use.
- Norbert Haala from Stuttgart University (Germany) presented “High density image matching”, based on the first “High Density Image Matching” benchmark project (see below). It highlighted the current state-of-the-art in reconstructing dense surface descriptions from aerial images exploiting the small GSD and high image overlap.
- Clement Mallet from IGN France (in Paris) presented the outcomes of the EuroSDR project “Change detection in High-Resolution land use/cover geodatabases (at object level)”, concentrating on classification and on how to use it for change detection, both from a theoretical and a practical point of view.

The project “**Benchmarking on Terrestrial Laser Scanning for Forestry Applications**” was officially started in October 2013 and first activity commenced beginning of 2014: acquisition of TLS and reference data, generation of ground truth, distribution of data to participants. It is a benchmark project which is conducted by Xinlian Liang and Juha Hyyppä from NLS (National Land Survey of Finland, former FGI, Finish Geodetic Institute). Terrestrial laser scanning (TLS) data was acquired for 24 forested sites, and participants are asked to provide terrain models, tree positions and tree parameters (diameter at breast height, etc.) by their own automatic methods. The project rationale is the foreseen increase of both, TLS and ALS data, in national forest inventories. Data can be obtained via FTP by contacting Xinlian Liang ([xinlian.liang@nls.fi](mailto:xinlian.liang@nls.fi)) or Harri Kaartinen ([harri.kaartinen@nls.fi](mailto:harri.kaartinen@nls.fi)).



Figure 12: Left: Image of data acquisition (<http://www.eurosdn.net/research/project/project-benchmarking-terrestrial-laser-scanning-forestry-applications>)

Right: Point cloud of one single tree extracted from one scan.

Results from participants will be collected in 2015 and compared to ground truth as well as to each other in order to understand the effect of different algorithms, identify area for additional research and development, and thus foster the use of terrestrial and airborne Earth observation data in forest inventories.

The very successful project “High Density Image Matching” was finished but immediately gave rise to a second project on this topic, reflecting the ongoing technological developments. It will be conducted, again, by Norbert Haala from Stuttgart University. This benchmark project is conducted together with ISPRS and is called “**Benchmark on High Density Aerial Image Matching**”. The scope is not only DSM production from aerial images, but also the generation of point clouds. The aim is to help users in NMCAs to understand the applicability of such tools for nation-wide DSM generation while triggering further developments based on their needs. The image data sets were diversified with regards to the first project, now covering two data sets with nadir imagery, captured over different land-use and with different block geometry, and a third data set including oblique aerial images. More information, including the access to the image data made available to the test participants, is available at the website: [www.ifp.uni-stuttgart.de/EuroSDR/ImageMatching/index.en.html](http://www.ifp.uni-stuttgart.de/EuroSDR/ImageMatching/index.en.html). For 2015 a workshop is planned.



Figure 13: Visualization of a matching result of the Munich data set

(<http://www.ifp.uni-stuttgart.de/ISPRS-EuroSDR/ImageMatching>)



### 6.1. Project in the picture: ‘Benchmarking on Terrestrial Laser Scanning for Forestry Applications’

EuroSDR conducts benchmark projects in order to identify the advantages and drawbacks of different approaches tackling the same problem. In 2013 the project “Benchmarking on Terrestrial Laser Scanning for Forestry Applications” was initiated by Juha Hyyppä and Xinlian Liang from the Centre of Excellence in Laser Scanning Research (coelasr) and the research department of the National Land Survey of Finland, and was running in 2014.

Quantitative, high resolution Earth observation and its automated processing are not only standard tools for NMCAs, but they are becoming more and more established in the environmental sector and the geosciences as well. Well advanced in this respect is forestry, and the combination of terrestrial remote sensing with airborne and satellite remote sensing, is the topic of investigation.

In many European countries, national airborne laser scanning data is available. Eventually, this will lead to more accurate forest inventories. In this context terrestrial laser scanning is becoming very interesting, because it allows deriving many tree attributes with very high reliability and efficiency. The combination of terrestrial and airborne laser scanning thus has the potential to establish correlations between ground based and airborne observations. An obvious pair of such parameters is tree diameter and tree height, acquired by fully automated analysis of terrestrial and airborne laser scanning point clouds. Currently, national or regional allometric models are used to infer one parameter from the other, thus disregarding many influencing site factors.

The international benchmark aims to identify those methods of processing terrestrial laser scanning data that provide the most complete and accurate models for single tree positions, stem diameter at different heights, and forest ground elevation. Not only the difference caused by the different algorithmic approaches are investigated, but additionally also the influence of the forest and site parameters (species, density, ground vegetation), and the influence of the input data. For the latter, each investigated plot was measured with one station in the middle, but, as alternative method, also with four stations in an average square. All together 24 plots of 32m by 32m were acquired during Summer 2014 and distributed to the test participants. For one of the plots, also reference data is provided to the test participants.

All results of the participants are analyzed by the project leaders with one common method. This ensures a fair comparison and allows to draw reliable conclusions. Test results will be analyzed in the second half of 2015, so stay tuned to the project “Benchmarking on Terrestrial Laser Scanning for Forestry Applications”.

Centre of Excellence in Laser Scanning research: <http://laserscanning.fi/>

NLS, Finnish Geospatial Research Institute FGI: <http://www.fgi.fi/>

Juha Hyyppä: [juha.hyyppa@nls.fi](mailto:juha.hyyppa@nls.fi)

Xinlian Liang: [xinlian.liang@nls.fi](mailto:xinlian.liang@nls.fi)



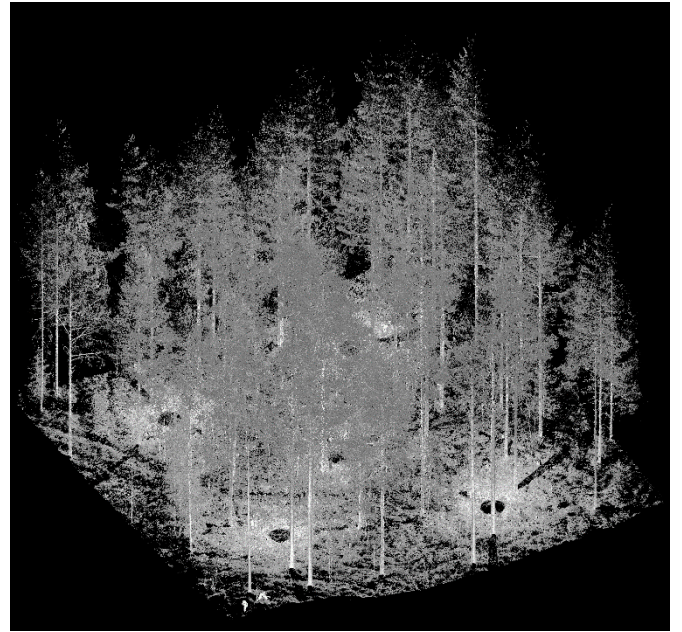
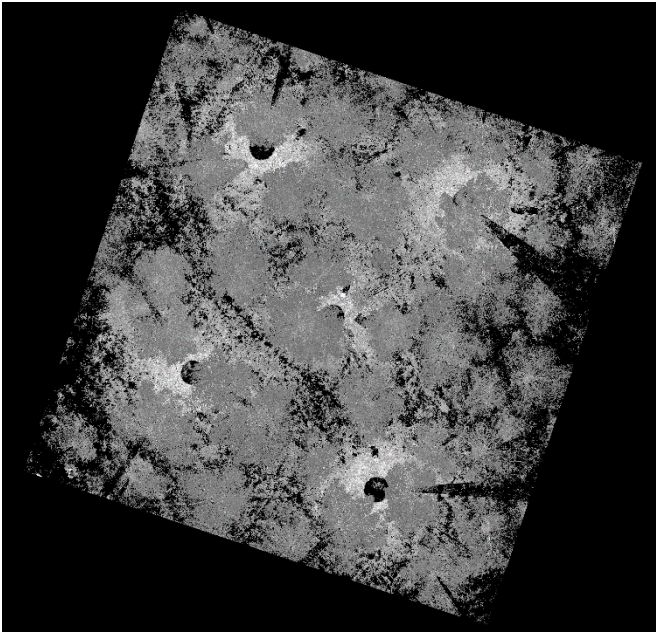


Figure 14 : Single-scan TLS data of a test plot in 2D (left) and 3D (right)

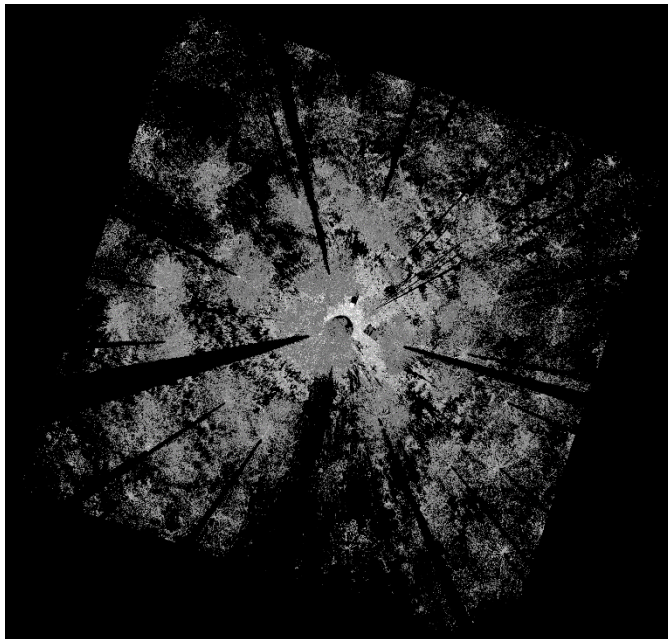


Figure 15 : Multi-scan TLS data of a test plot in 2D (left) and 3D (right)

## 7. Commission III: Production Systems and Processes

### Jon Arne Trollvik



The mission of Commission III is to evaluate, demonstrate and further develop production systems and processes for handling geo-spatial information by closely incorporating private industries in these EuroSDR activities. The 2014 activities had focus in two directions; on a working group on Preservation of the Geographical production process, and on work with preparations for the Sentinels, that will give us huge volumes of satellite data in the years to come.

#### 7.1. WG 'Preservation of the Geographical Production Process'

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 successful kick-off meeting organized in Brussels at the National Geographic Institute in 2013, was followed by a productive and positive meeting at Ghent University on the 1st and 2nd of December 2014. The 2nd half day was held jointly with the symposium by the International Cartographic Association (ICA) commissions on Map Production and on the History of Cartography.

The workshop focused on the organizational aspects (future), on a framework for cooperation, which was illustrated by a few excellent practices from amongst others Norway, Sweden, Switzerland, the Netherlands, the UK (Charles Close Society) and Belgium. Main questions were: how to preserve our heritage of cartographic production methods and how to finance preservation and research in a national and international context.

#### Some excellent practices

Norway's national mapping agency (Sidsel Kvarteig) demonstrated several excellent examples, such as the website [www.digitaltmuseum.no](http://www.digitaltmuseum.no) that gives us digital access to images of amongst others cartographic production tools. The website and metadata-standard is in Norwegian and Swedish only, but the company that built the website would be happy to be of assistance in an international framework. Another example is the small museum they built with the help of (retired) colleagues and volunteers that shows complete production settings from the past (as if the employee just walked away...), which was even inaugurated by the King of Norway.

Martin Schlatter of Swisstopo demonstrated several initiatives with regard to their heritage:

- (1) a dynamic and interactive viewer with time-slider that displays the maps produced over time on a base map of Switzerland,
- (2) web-pages very neatly documenting map series, including their production processes,
- (3) archiving system of digital-born geodata.

Nico Bakker of The Dutch Kadaster & National Mapping Agency showed us their initiatives on:

- an elaborated and still growing museum of map production techniques,
- thorough inventories on the (history of) map production techniques in all its aspects (See the Dutch Kadaster Museum (<http://bit.ly/1DN1TSR>)),
- their co-operation with the popular Geo-Fortress museum,
- plans to organize a meeting on map production techniques in the autumn of 2015.

One of the potential initiatives that we could tap into, which is launched in the course of 2015, is the Flemish (Belgium) part of the Digital Research Infrastructure for the Arts and Humanities (DARIAH) Virtual Research Environment Service Infrastructure for textual and GIS data assets (DARIAH-VL VRE.SI, see [www.ghentcdh.ugent.be](http://www.ghentcdh.ugent.be)). The project leader of the programme would welcome a pilot with regard to (meta)data and collaboration with regard to the aims and objectives.

Philippe De Maeyer of Ghent University recently inherited the international collection of instruments used in geographical production processes, comprising hundreds of items and descriptions from the last century. Together with the NGI (Belgium) they continue their efforts to digitize instruments and documents from the NGI. Rink Kruk of the National Geographic Institute demonstrated their innovative geo-portal that takes away the barriers for accessing the largest old map collections on Belgium and Central Africa.

France (IGN France) and Germany (several Länder) built a few websites that document certain parts of the production processes documentaries in YouTube-style format.

### Focus

One of the initiatives that is brought forward by the group is to bring online existing standard glossaries-of-terms. Several excellent glossaries that well-document the production processes in terms of “terms” have been published before on paper. An objective is to verify if such glossaries-of-terms could be brought online in cooperation with the publishers of these glossaries (e.g. ICA: Dutch/French/English; FIG; ...).

One common standard to describe the map production objects is needed in order to bring our mutual heritage together and make it mutually accessible. Options to consider are the Nordic standard, the Dutch example, SIDOC-CRM (Standard from archeology), or a combination of best practices.

National Mapping Agencies should be encouraged to pick up the line, as information is lost rapidly these days and the importance of well-documenting production processes is taken seriously by only a few mapping agencies nowadays. A possible way to push it forward would be the draft of a EuroSDR whitepaper, communications through closely related organizations such as EuroGeographics, ICA and FIG. More serious attention to the issue of archiving production techniques needs to be given to the availability of qualified staff to document the production techniques and make it accessible.

### Next steps

A more formal questioning will be distributed by Philippe De Maeyer (UGent) through ICA to search for potential partners and (re)sources for fulfilling the Working Group’s objectives in cooperation with the ICA. This initiative will be discussed on a high-level meeting on the ICA conference in Rio-de-Janeiro this Summer. In order to search for alternative funding channels and to contribute to the fulfilment of the objectives of the Working Group, a follow-up meeting is scheduled for the end of 2015 in the Netherlands, or possibly Norway/Switzerland.

The website is (being) redesigned and is accessible at <http://geoheritage.ugent.be> for further news, presentations and reports.



## 7.2. Workshop in the picture: ‘Preparations for Sentinel-2 in Europe’

The workshop “Preparations for Sentinel-2 in Europe” took place late November 2014 in Oslo with about 40 participants. The initiative to the workshop came from Norway where preparations for the optical satellite Sentinel 2 have been going on for some years. The main purpose of the workshop was firstly to initiate contact and collaboration among national agencies (or project groups) in Europe responsible for preparing and providing satellite data, or preparing support and services to national users of satellite images, with special focus on Sentinel-2 and Landsat 8. Second, to share experiences and knowledge gained in the preparations for Sentinel-2 in each country; identify common challenges and discuss possible solutions; identify fields of possible cooperation. All presentations and wrap up’s from breakout sessions are available at the EuroSDR home page. Recommendations from the workshop are presented below. (<http://www.eurosdrr.net/workshops/preparations-sentinel-2-europe>).



Figure 16: Presentation of Carsten Brockmann of Brockmann consult at the Sentinel-2 workshop in Oslo.

### Workshop recommendations

- Orthorectification with PlanetDEM 90 will do a good job for most of Europe, but not for all areas. Areas with rough topography and high latitudes need a DEM with better quality. Nordic countries with high latitudes north of 60 degrees have common interest in an improved DEM for these areas. A common initiative towards ESA to solve this issue is recommended.
- It is recommended that Landsat 8 data is orthorectified using the same DEM as for S-2 in order to fuse the datasets.
- Atmospheric correction over land and water and high latitudes has different requirements. The solution adopted by ESA should address this issue and allow for special treatments according to area and user demands.
- The mirror sites are recommended to archive level 1B and process level 1C and 2A, either systematic or on-demand. However, it should be considered to archive level 1A instead of 1B. If there is a reprocessing of level 1B by ESA, it might be more efficient that the mirror sites reprocess from 1A to 1B instead of downloading 1B again.

- International collaboration to build up data centres should be considered. It would possibly be more cost efficient and give higher quality and a common standard of services. We must identify similarities in needs between countries and areas for possible collaboration. EODC is an example of an initiative to foster international cooperation.
- Data volume from S-2 will be very large. It is recommended to bring algorithms and SW to the data (server side) instead of data to the SW (user side). On the fly-processing will demand more from the data store than systematic processing (i.e. data cube vs. file system). The French Theia is an example of a national data centre that has taken a systematic approach to processing.
- A workshop at this level was welcomed and several participants proposed a follow-up workshop in one year time to report national status, progress, and discuss common challenges.



Figure 17: Participants at the Sentinel-2 workshop in Oslo.

## 8. Commission IV: Data Specifications

### Jantien Stoter



The mission of commission IV is to facilitate appropriate use of large amounts of spatial data within geo-information infrastructures to solve spatially related problems. In 2014, several activities have been organised by this commission to contribute to this mission.

#### EuroSDR 3D SIG

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 spatial applications. Consequently, National Mapping Agencies are looking for solutions that help them to collect, update, maintain and disseminate 3D data as part of their existing data flows.

Since autumn 2013 ten National Mapping Agencies are working together on 3D issues in the EuroSDR 3D Special Interest Group (3D SIG). The aim of this group is to define and 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, to carry out research projects on topics of common interest and to organise a workshop series on relevant topics. In 2014, they met three times and worked on the following achievements.

The 3D SIG members wrote a paper about their progress in 3D and remaining issues. This paper was presented at the international 3D symposium, Dubai, November 2014 as well as at the OGC technical committee meeting in Japan, December 2014.

On 28th and 29th of November 2014, the EuroSDR 3D SIG and two ISPRS working groups organised a workshop on "Efficient capturing of 3D objects at a national level: with a focus on buildings and infrastructure". Recently, important research results have been achieved on automated 3D reconstruction, yet the challenge remains as to how to apply these results to obtain and maintain nationwide 3D data sets. This workshop was organised to bridge this gap between researchers and practitioners and aimed at specifying the minimum 3D modelling requirements of NMAs; identifying, together with industry and researches, the most efficient 3D object capture methodologies for very large areas (e.g. national coverage); and explicitly addressing the distinction between initial data capture and the incremental update of existing national models. The last will require embedding the 3D modelling within established processes of continuous incremental updating of countrywide data sets. Presentations were given on 3 main topics: the 3D creation process, use of large 3D data sets and 3D data capturing for nationwide maps. In addition, the participants discussed in break out sessions about user requirements and generic 3D data models for 3D topography.

In addition to the workshop, a special issue of the International Journal of Geo-Information is in preparation for 2014. This IJGI Special Issue is meant to support the topics of the workshop by collecting and publishing full papers on related issues. Submission of relevant papers to this issue is open to every author, not limited to authors who presented at the workshop. The EuroSDR 3D SIG also started a project on the 'Economic Benefits of 3D data' which is carried out by University college London. Outcomes are expected in autumn 2015. Finally the EuroSDR3D SIG is one of the initiators of the OGC Interoperability Experiment on the quality of 3D data.





Figure 18: Participants at the workshop 'Efficient capturing of 3D objects at a national level: with a focus on buildings and infrastructure'

### **OGC Interoperability Experiment to define and validate data quality requirements of CityGML (3D) data**

The OGC Interoperability Experiment (QIE) on defining and validating data quality requirements of CityGML data is a joint initiative of OGC, SIG3D and EuroSDR 3D SIG.

The aim of the experiments is to formally define data quality requirements for a general CityGML data specification, to provide recommended implementation guidance for 3D data, and to provide a suite of essential quality checking tools to carry out quality assurance on CityGML data. This will be accomplished by evaluating the quality of existing CityGML data as well as of CityGML sample data sets that have been specifically developed for this experiment with available quality checking tools. The data requirements and recommended implementation guidance will be defined from the insights obtained by these experiments and may serve as input to extend and refine the CityGML standard. This will meet the wish of the geo-community for better implementation guidance for each OGC standard, in this case CityGML. The project started with a kick-off at Dutch Kadaster, Amsterdam in September 2014. Outcomes are expected around summer 2015.

### **Linked Open data**

Since a few years the topic "linked (open) data" (LOD) is mentioned now and then at EuroSDR meetings. Therefore it was decided to invite a key-note speaker, i.e. Erwin Folmer from TNO/Geonovum, the Netherlands, during the 124th EuroSDR delegates meeting (May 14-16, 2014, Apeldoorn) to explain what one can do with LOD, its state-of-the-art, expected developments as well as why it would be relevant for EuroSDR members and what EuroSDR activities should be started on this topic to support the use of LOD by NMCAs. The followed break out session showed a need to further explore the potentials of linked (open) data for NMCAs. Consequently a position paper was written and presented at the autumn meeting in Leuven. As follow up, in 2015 a work session will be organised to define a common project on this matter to meet the need to align current spatial data activities in NMCAs to newest technologies and developments.

## 9. Intercommission Working Group on Standards

### Wolfgang Kresse



This Intercommission Working Group on Standards works as an interface between EuroSDR and the world of standardization which includes the ISO/TC 211 “Geographic information / Geomatic”, the Open Geospatial Consortium and other standardization bodies. In most cases standardization is not a straight-forward process to a large document but rather a long process of communication and discussion of alternatives. In addition, this working group monitors several standardization activities and evaluates their relevance for EuroSDR.

The ISO/TS 19159-1 “Calibration and validation of remote sensing imagery sensors – Part 1: Optical sensors” was published in August 2014, after it originally started as the EuroSDR-Project on Digital Camera Calibration.

The ISO/TS 19159-2 “Calibration and validation of remote sensing imagery sensors – Part 2: Lidar” has evolved as one of fastest standardization projects of ISO/TC 211. The Working Draft was considered as being sufficiently mature to directly send the document to the final vote for a Draft Technical Specification while leaving out the Committee Draft stage. It means that this project is more than one year ahead of schedule.

The ISO/TS 19159-3 “Calibration and validation of remote sensing imagery sensors – Part 3: Radar” has started recently. EuroSDR has chaired parts 1 and 2, and is cooperating with part 3.

Preservation is an urgent topic for all organizations which have responsibilities for digital geospatial data. Mainly driven by the European Mapping and Cadastral Agencies as well as a community that is involved in the processing of data taken from spacecraft which are mostly imagery data, EuroSDR has started a New Work Item Proposal (NWIP) of ISO/TC 211 titled “Preservation of digital data and metadata”. This new standard shall help to pave the way to an adequate long-term archival of geospatial vector and raster data.

Furthermore, this working group is involved in several smaller topics such as the extension of the widely applied 2D-transformation standard NTV2 (National Transformation version 2) to the third dimension.



## 10. Intercommission Working Group on Education

### Markéta Potůčková



The main goal of the working group is to support the transfer of knowledge from EuroSDR research projects to NMCAs, academia and industry. For this purpose, an educational service (EduServ) combining a two-day seminar and e-learning has been arranged annually since 2002. In spring 2014 it continued with its 12th series. Four two-week e-learning courses focussing on new developments in information extraction from imagery and on fusion of aerial images and laser scanning were offered to participants:

- High density image matching  
Tutor: Norbert Haala (IFP, University of Stuttgart University),
- Integrated use of airborne laser scanning and aerial photogrammetry  
Tutor: Petri Rönholm (Aalto University),
- Mapping using high-resolution satellite imagery  
Tutor: Daniela Poli (Terra Messflug GmbH),
- Change detection in High-Resolution land use/cover geodatabases (at object level)  
Tutor: Clément Mallet (IGN France).

The course topics and the Moodle learning platform were introduced during a pre-course seminar hosted by Dr. Fabio Remondino at the premises of Fondazione Bruno Kessler (FBK) in Trento, Italy from 3rd to 4th March 2014. About 20 participants joined this event. The e-learning part of the educational service was actively followed by 39 attendees; most of them took part in at least two courses.

Looking to 2015, the EduServ advisory board in collaboration with the EuroSDR management team finalized the topics for the 13th series of EduServ. It opened for registration in November 2014.

As a new educational activity built on the EuroSDR network, an intensive one week residential course in gravity and height for national mapping and geodetic surveying was proposed by Kevin Mooney from Dublin Institute of Technology (DIT) in spring 2014. It originated from a request to DIT from the Irish national mapping agency, Ordnance Survey Ireland (OSi), for a Masters course in Gravity and Height. A need was thus identified to strengthen knowledge of both Master/PhD students and practitioners in this specific but rather narrow field. It was also evident that DIT could not fully support nor sustain such a regular course by experts from its own staff. Collaboration among specialists from DIT, the Swedish Lantmäteriet, the Dublin Institute of Advanced Studies and OSi resulted in the design of a 5 ECTS course opened for staff of national mapping agencies, public authorities and Master/PhD students interested in height determination and maintenance. This new model of cooperation among EuroSDR members in education and capacity building was approved during the 125th BoD meeting in Leuven and the accreditation process was completed by DIT at the end of the year. The first run of the course will start on 2nd February 2015.

## 11. Workshops

- EuroCOW (12-14 February 2014, Castelldefels, Spain)
- SIFET/EuroSDR UAV/RPAS Workshop (20-21 February 2014, Modena, Italy)
- Joint EuroSDR/ISPRS session about Sensors at Geospatial World Forum (5-9 May 2014, Geneva, Switzerland)
- EuroSDR/AGILE workshop 'Geoprocessing on the Web' as a pre-conference workshop of AGILE 2014 (3 June, Castellón, Spain)
- EuroSDR/ISPRS session about the integration of different types of oblique imagery at the TC I Mid-term symposium 2014 (17-20 November 2014, Denver, USA)
- EuroSDR Workshop 'Preparations for Sentinel 2 in Europe', (25 - 26 November 2014) (Norwegian Space Centre, Oslo, Norway)
- EuroSDR/ISPRS workshop Efficient capturing of 3D objects at a national level: with a focus on buildings and infrastructure (27 - 28 November 2014 (Ordnance Survey, Southampton, UK) Workshop of the Heritage Working Group on 'Preservation of the geographical process' (1-2 December, Brussels, Belgium)



Figure 19: EuroCOW workshop in Castelldefels in Spain

## 12. Publications

All recent publications can be downloaded from our website.

64. Domenech, E., Mallet, C., **Change detection in High Resolution Land Use/Cover Geodatabases (at object level)**.

Haala, N., **Change detection of Benchmark of Image Matching**

Walter, V., **A survey on the state of the art of 3D Geographical Information Systems**

Mooney, P., Morley, J., **Crowdsourcing and National Mapping**

Report of EuroSDR projects, 166 pages, Vienna, 2014

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., Hyypä, 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.
54. Kolbe, T.H. (ed.), 2008. Final report on the EuroSDR **CityGML** Project.  
 Patrucco, R. & Murray, K. (eds.), 2008. Proceedings of the EuroSDR/EuroGeographics workshop **'Production Partnership Management'** held from 7th to 9th November 2007 in Southampton, UK.  
 Colomina, I. & Hernández, E. (eds.), 2008. Proceedings of the Institut de Geomàtica / EuroSDR **'International Calibration and Orientation Workshop EuroCOW 2008'** held from 30th January to 1st February 2008 in Castelldefels, Spain.  
 Heipke, C. & Sester, M. (eds.), 2008. Proceedings of the ISPRS / EuroSDR Workshop **'Geosensor Networks'** held from 20th to 22nd February 2008 in Hannover, Germany.  
 Frankfurt a.M. 2008.
53. Kaartinen, H. & Hyypä, J., 2008. **Tree Extraction** - report of EuroSDR project. 60 pages. Frankfurt a.M. 2008.
52. Murray, K. zs., 2007. Proceedings of the International Workshop: **'Land and Marine Information Integration'**, Malahide, Dublin, Ireland. March 2007.
51. Höhle, J. & Potuckova, M., 2006. The EuroSDR Test **"Checking and Improving of Digital Terrain Models"**  
 Skaloud, J., 2006. **'Reliability of Direct Georeferencing, Phase 1'**: An Overview of the Current Approaches and Possibilities  
 Legat, K., Skaloud, J. and Schmidt, R., 2006. **'Reliability of Direct Georeferencing, Phase 2'**: A Case Study on Practical Problems and Solutions. Frankfurt a.M. 2006.
50. Kaartinen, H. & Hyypä, J., 2006. **'Evaluation of Building Extraction'** Report.  
 Steinnocher, K. & Kressler, F. 2006. **'Change Detection'** Report.  
 Bellmann, A. & Hellwich, O., 2006. **'Sensor and Data Fusion Contest'**: Information for Mapping from Airborne SAR and Optical Imagery (Phase I Report).  
 Mayer, H.; Baltsavias, E. and Bacher, U., 2006. **'Automated Extraction, Refinement, and Update of Road Databases from Imagery and Other Data'** Report. Frankfurt a.M. 2006.



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