

EuroSDR e-learning for strengthening capacity in the geospatial domain

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Abstract

Due to rapidly advancing technology and increasing societal needs, there is a significant demand for capacity building in the geospatial domain, which involves developing the skills, knowledge, and resources of individuals and organisations. The European association EuroSDR, a not-for-profit international network linking National Mapping and Cadastral Agencies (NMCA) with academic and research institutions in Europe, recognised the challenges of skills development in the geospatial domain more than two decades ago. The EduServ annual training programme, organised under the EuroSDR umbrella, is a well-established and internationally recognised series of e-learning courses in photogrammetry, remote sensing, and geospatial information (GI) science. Since its inception in 2002, it has primarily aimed to transfer knowledge from EuroSDR research projects to the wider GI community. In recent years, interest in EduServ courses has increased significantly, and the topics have expanded to address new geospatial technologies and growing societal needs. This paper aims to share EuroSDR's experience in distance education with the wider scientific community. Rather than limiting EuroSDR expertise to the European GI community, European NMCAs can share their knowledge and experience with the international geospatial community.

1. Introduction

Geospatial information provides an integrated platform for digital data with a geospatial component, such as location, and is essential for addressing the challenges of ecological and digital transitions. Countries with geospatial information infrastructures across sectors require geospatial information to support state development and decision-making. However, there is a noticeable lack of innovative geospatial information solutions in practice at both global and national levels (UN-GGIM, 2023). To overcome these obstacles, it is necessary to establish a supportive environment for implementing innovative solutions and to provide capacity-building programmes for both developers and users of geospatial data and services at the national level, where international collaboration is crucial.

Capacity development and lifelong learning have also become central concerns for national mapping agencies, which are undergoing rapid transformation from traditional authoritative spatial data providers to coordinators of national geospatial information infrastructure and enablers of geospatial information services within complex digital ecosystems. This shift is driven by advances in geospatial technologies, the proliferation of data sources, and increasing societal demand for timely, integrated, and actionable spatial information (see also UN-GGIM, 2020b). In this context, capacity development must be understood as a systemic process encompassing human skills, institutional arrangements, and technological capabilities.

In Europe, EuroSDR plays an important role in research and knowledge transfer in domains relevant to geospatial information infrastructure and national mapping agencies (EuroSDR, 2026). It brings together national mapping and cadastre agencies (NMCAs), academia and key private companies for applied research and the development and sharing of innovative solutions, securing timely, research-based knowledge that enables agencies to fulfil their roles as content

providers and government competence centres for geospatial information, services, and infrastructures (Streilein et al., 2016).

This paper presents EduServ, the Education Service of EuroSDR, which addresses the research needs of formal geospatial data provision and management in Europe.

2. About EuroSDR

EuroSDR, the European Spatial Data Research network organisation, is a not-for-profit body that connects NMCAs with research institutes, universities, and companies across Europe to conduct applied research in geospatial data provision, management, and delivery. Its origins date back to 12 October 1953, when the *Organisation Européenne d'Etudes Photogrammétriques Expérimentales* (OEEPE) was established, primarily to address challenges related to the quality and efficiency of aerial surveys, and to support the development and improvement of photogrammetric methods for authoritative data (Heipke et al., 2003). OEEPE and its members significantly contributed to the quality of topographic mapping and authoritative geospatial data in Europe. In the late 1990s, the OEEPE broadened its field of activity in response to the rapid development of geospatial technologies, including new sensors and platforms, as well as advances in digital data processing. Progress in geospatial technologies, and the development of methods, systems and standards for the acquisition, processing, production, maintenance, storage, and dissemination of core geospatial data and information, were the main reasons for the reorganisation and formation of the not-for-profit organisation European Spatial Data Research (EuroSDR) in 2003 (Streilein et al., 2016).

2.1 EuroSDR vision

EuroSDR's main value to the geospatial domain lies in providing technology-based, research-driven knowledge about spatial data infrastructures and geospatial information services,

with a particular focus on authoritative geospatial reference data. With members from twenty European countries and strong collaboration with related European organisations, such as EuroGeographics or AGILE, EuroSDR has extensive experience in addressing the scope and nature of geospatial information needs. Its value stems from facilitating interaction between research organisations and the public and private sectors to exchange ideas and knowledge on relevant research topics, supporting and contributing to research projects, and transferring knowledge and research results to real-world applications (EuroSDR, 2014, 2026; Streilein et al., 2016).

EuroSDR’s vision is to serve as the European research platform for NMCAs, academic institutions, the private sector, industry, and user groups on issues related to implementing technological developments to optimise the provision – such as collection processing, storage, maintenance, visualisation, dissemination, and use – of reference geospatial information within a Spatial Data Infrastructure context (EuroSDR, 2026).

2.2 EuroSDR operations

The geospatial information research interests of European countries are consolidated and discussed through the national representatives of EuroSDR member countries, who come from NMCAs and academia. Knowledge is generated by facilitating best-practice interaction between research organisations and the public and private sectors, with the aim of (Streilein et al., 2016; EuroSDR, 2025) (i) exchanging ideas and knowledge about relevant research problems, (ii) facilitating and contributing to research projects, and (iii) transferring knowledge and research results to practitioners and production teams.

The EuroSDR research plan, projects and results, as well as other relevant scientific, technical and administrative matters, and technology transfer activities, are discussed and reported during the regular meetings of member organisations’ representatives, i.e. the Board of Delegates (BoD), held twice a year (Streilein et al., 2016). To address the latest challenges in the geospatial information domain, particularly regarding geospatial authoritative reference data and geospatial information infrastructure, a rolling research plan is developed every four years. This plan defines the framework for EuroSDR research, development and education (EuroSDR, 2025).

The EuroSDR Commissions (Figure 1) act as a catalyst between members to initiate projects, and also between the research projects and the EuroSDR network. Each commission, led by a commission chair, conducts research activities and organises workshops and training on specific topics. Currently, EuroSDR is structured into five commissions (EuroSDR, 2024):

- **Commission 1: Data Acquisition**, with the mission to investigate, test and validate platforms, sensors and algorithms to acquire geospatial data, with emphasis on precision, accuracy, reliability, feasibility and standardisation of primary data acquisition procedures.
- **Commission 2: Data Processing, Modelling and Integration**, with the mission to contribute to advanced methods of modelling and processing spatial information by investigating, demonstrating, evaluating and documenting new approaches to reconstruction/generation, maintenance, processing, structuring, integration and distribution of spatial information.
- **Commission 3: Information Usage and Visualisation**, with the mission to explore, demonstrate and contribute to increasing the usage, access, distribution and visualisation of authoritative geospatial data, as well as to investigate

improved service mechanisms for the dissemination of geodata from database to end-users.

- **Commission 4: Business Models and Operations**, with the mission to contribute to the development and implementation of business models describing how mapping and cadastral agencies can create, deliver and capture value, in economic, legal, social, governance, cultural, sustainable or other contexts.
- **Commission 5: Knowledge Transfer**, with the mission to provide educational services to support the transfer of knowledge from EuroSDR research projects, workshops and other EuroSDR activities to national mapping and cadastral agencies (NMCAs), academia and industry.

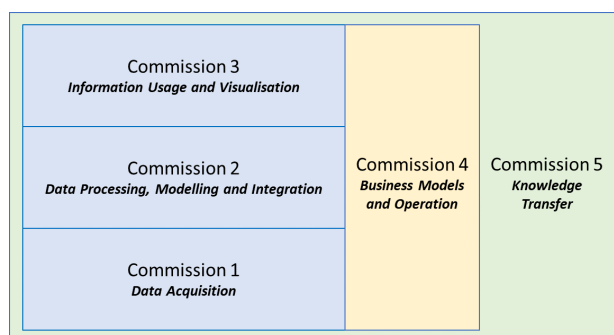


Figure 1. EuroSDR commissions (based on EuroSDR, 2025).

There is strong interaction between the commissions, both thematically and organisationally. The main activities include research projects, organisation of workshops and benchmarks, dissemination activities including publications, and educational activities. In the context of knowledge transfer, the mission of EuroSDR is to provide educational services in the geospatial information domains to support the transfer of knowledge from EuroSDR research projects, workshops and other EuroSDR activities to NMCAs, academia and industry.

2.3 EuroSDR knowledge transfer challenges

The geospatial domain is being transformed by rapid technological advances, including the automation of mapping workflows, integration of satellite, sensor, and crowdsourced data, and the development of real-time and 3D geospatial systems. A major challenge across the geospatial sector is the shortage of qualified professionals, particularly in emerging areas such as geospatial data science, AI, and cloud infrastructures. At the same time, the pace of technological change leads to rapid skills obsolescence, requiring continuous reskilling. In addition, NMCAs are increasingly shifting from data producers to ecosystem enablers, supporting a wide range of stakeholders across government, the private sector, and society. International frameworks emphasise the importance of collaboration, partnerships, and data sharing across sectors (see also UN-GGIM, 2020a; UN-GGIM, 2023).

These developments require NMCAs to transition towards data-driven, continuously updated systems, placing new demands on workforce skills and organisational adaptability. EuroSDR member organisations are diverse and at various stages of introducing new technologies into their working processes. EuroSDR, therefore, aims to facilitate the transfer of key knowledge and experience from countries that have successfully implemented advanced geospatial solutions to those at a much earlier stage (Fritsch et al., 2013). The development of internet technology and e-learning platforms has created many opportunities for skills development at the international level.

These challenges and opportunities began to be discussed in the geospatial domain more than 20 years ago (Martin et al., 2003; Vanden Berghe and Mooney, 2011), when EuroSDR introduced its annual programme of e-learning courses.

Today, through its knowledge transfer activities, EuroSDR focuses on meeting specific NMCAs' needs for knowledge and skills updates, data collection and dissemination methodologies, developed tools, and other research outcomes. These are delivered through annual e-learning courses (EduServ), short on-demand courses, workshops and EuroSDR's official publications.

3. EuroSDR's e-learning courses - EduServ

EuroSDR annually offers four two-week e-learning courses in the fields of geospatial information and technologies, known as EduServ (EuroSDR education service). It originated in 2001, when a *Taskforce on Education* was established, chaired by Professor Joachim Höhle of Aalborg University. The main motivation was the recognition that transferring results from EuroSDR research projects and workshops through publications was insufficient to reach users or to impact geospatial data production and development at NMCAs. Another reason was the increasing need for continuing professional development at NMCAs (Höhle, 2008). The main role of the *Taskforce on Education* was to (i) select EduServ course topics with EuroSDR project leaders and workshop organisers, (ii) organise the EduServ courses, and (iii) monitor the effectiveness of the EduServ series and report to the EuroSDR delegates (Höhle, 2008).

In 2013, the EuroSDR *Taskforce on Education* was renamed the *EduServ Advisory Board*, now led by the Commission 5 chair. The main role of the Advisory Board is to specify the EduServ concept and content, and to ensure a high level of educational services (Figure 2), which include (EuroSDR, 2024):

- design of EduServ structure, organisation, and their update based on observations and feedback from participants, tutors and seminar hosts,
- suggestions of course topics of interest to NMCAs, academia and the geospatial industry,
- approval of course topics and content,
- promotion of EduServ (contributing to conference papers and presentations),
- collaboration with other organisations (e.g., ISPRS, AGILE, OGC) in educational activities.

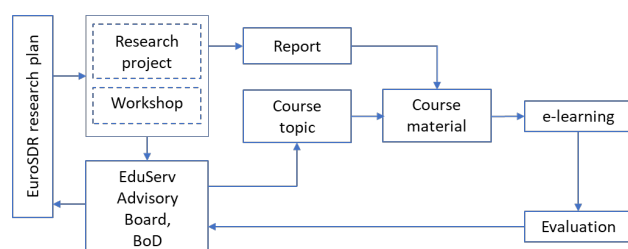


Figure 2. EduServ courses are designed for knowledge transfer from the research to the production (based on Höhle, 2008).

3.1 EduServ model

Since their inception in 2002, EduServ courses have been designed as e-learning courses based on the principle of 'Learning by Doing', and therefore include practical assignments that require participants, for example, to manipulate data or processes, evaluate the consequences and

draw reasoned conclusions (Höhle, 2008; Vanden Berghe and Mooney, 2011). The main aim has been to facilitate the transfer of outcomes from EuroSDR research activities to the user domain, such as key personnel in geospatial information production organisations, research institutions, and the geospatial industry (Fritsch et al., 2012).

Annual EduServ programmes consist of four consecutive e-learning courses linked to the research activities of EuroSDR. As participants often have diverse technical backgrounds – coming from national mapping agencies, other public institutions, universities, research institutions, or the private sector – the e-learning courses are preceded by a two-day pre-course seminar. During this introductory seminar, participants receive background materials and all necessary instructions to enable them to follow the e-learning courses from their own organisations. Course tutors, in turn, receive information about the participants' backgrounds, which can enhance course delivery. The seminar is carefully designed to include a social element, allowing participants time to relax and get to know the course tutors and fellow participants. Bringing together participants from a variety of professional backgrounds generates a synergy that leads to a fruitful exchange of experience (Mooney, 2005; Fritsch et al., 2012; Fritsch, 2014).

To date, EduServ pre-course seminars have been organised at academic institutions and, at times, at NMCAs from EuroSDR member states across Europe (Table 1). Fortunately, EuroSDR continues to find volunteers among its members to organise this important event. However, recently, there has been a decline in interest in the pre-course seminar, which may also be a consequence of the COVID-19 crisis.

Year	EduServ Host Organization	Country
2002	Aalborg University	Denmark
2004	Budapest University of Technology & Economics	Hungary
2005	Dublin Institute of Technology	Ireland
2006	ITC, Enschede	The Netherlands
2007	Charles University in Prague	Czech Republic
2008	Stuttgart University of Applied Sciences	Germany
2009	Norwegian University Life Science, Ås	Norway
2010	KU Leuven	Belgium
2011	ENSG Paris	France
2012	Dublin Institute of Technology	Ireland
2013	International Centre for Mechanical Sciences, Udine	Italy
2014	Fondazione Bruno Kessler (FBK), Trento	Italy
2015	BEV, Vienna	Austria
2016	University of Warsaw	Poland
2017	Delft University of Technology	The Netherlands
2018	TU Braunschweig	Germany
2019	Institut Cartogràfic i Geològic de Catalunya, Barcelona	Spain
2020	ENSG, Paris	France
2021	Online	-
2022	Online	-
2023	University of Ljubljana	Slovenia
2024	KU Leuven	Belgium
2025	Finnish Geospatial Research Institute (FGI)	Finland
2026	TU Delft	The Netherlands

Table 1. Host organisations of the EduServ pre-course seminars

The seminar is followed by two intensive weeks of e-learning for each course offered, using the Moodle course management system (Figure 3). Each course requires approximately thirty hours of work from participants.

Two-day pre-course seminar • Introduction to the four course topics • Introduction to the learning management system (LMS) • Meeting the tutors and fellow students ⇒ building networks • Participation is not obligatory to continue with e-learning	Two-week e-learning course Student: • Familiarisation with LMS • Study of course materials (presentations, literature) • Use of learning programmes and provided software • Self-tests (Quiz) • Solving tasks and submission of assignments • Discussion forum • Collaborative work Teacher: • Response to queries within 24 hours!
Evaluation • Issuing certificates of successful completion of the EduServ courses • Feedback from participants	

Figure 3. EduServ structure (based on Höhle, 2008).

Participants follow e-courses remotely using online materials and an e-learning platform. Each course is designed for self-study, allowing flexible scheduling. During the courses, participants have access to course tutors, with a guaranteed response to queries within 24 hours. The e-learning platform informs tutors and participants of progress, and encouragement is provided when necessary. Achieving the correct balance of content and assignments is essential to enhancing the learning experience. The difficulty of assignments should increase gradually from the first to the last. The introduction of the Moodle e-learning solution in 2009 contributed significantly to the success of the EduServ courses (Vanden Berghe and Mooney, 2011; Fritsch et al., 2013).

Initially, there was a significant challenge regarding participants' skills in e-learning domains (Fritsch et al., 2012). The situation has changed considerably over the past decade, as e-skills have been greatly strengthened. This is also why interactive tools such as quizzes, chats, and discussions are now more acceptable to tutors and participants. Recently, video lectures and live discussions via web-video platforms such as MS Teams and Zoom have been introduced and were very well received by EduServ participants. The video lectures, which are usually recorded and uploaded to the Moodle platform, are part of the e-learning materials and are also available to participants who are unable to join the live sessions.

Upon successful completion of the required assignments, participants receive a signed 'Certificate of Completion' from EuroSDR. Participants are asked to provide feedback to EuroSDR to help improve the educational services.

3.2 EduServ topics

Annual EduServ programmes comprise short, typically two-weeks, consecutive web-based e-learning courses linked to the research activities of EuroSDR or other relevant topics for the target audience. Each course is offered in two consecutive years. The widely ranged topics cover the entire life cycle of geospatial data and information provision, as well as development challenges related to establishing and managing geospatial information infrastructure. In the first decade of EduServ courses, they were organised solely as follow-up activities to EuroSDR research projects or workshops (Table 2). In the past decade, EuroSDR has introduced greater flexibility in planning, designing, and conducting e-learning courses.

Course title	Tutors' Affiliation	Years
Integrated sensor orientation	Univ. of Hannover	2002 2004
Automatic orientation of aerial images in databases	Aalborg Univ.	2002 2004
Laser scanning & airborne interferometric SAR	ITC, Enschede	2004 2005
Digital Cameras/Sensors	The Ohio State Univ.	2004 2005
Coordinate reference systems and transformations for spatial data position	Dublin Institute of Technology (DIT)	2005 2006
Positional accuracy improvement in GI databases	Ordnance Survey GB, TU Berlin, DIT	2005 2006
Quality of geospatial data and related statistical concepts	ITC, Enschede	2006 2007
Quality Control of DTMs	Aalborg Univ.	2006 2007
Mapping with SAR	TU Berlin	2007 2008
Laser scanning for 3D city models	Finnish Geodetic Institute	2007 2008
CityGML	TU Berlin, Uni. of Gävle	2008 2009
Geometric performance of digital airborne cameras	IPF Stuttgart Univ.	2008 2009
Schema matching, mapping and transformation for INSPIRE	Univ. of Gävle	2009 2010
Laser scanning for tree extraction	Finnish Geodetic Institute	2009 2010
Assessment of the quality of Digital Terrain Models	Aalborg Univ., Charles Univ. Prague	2010 2011
The INSPIRE Directive and its implementing rules	KU Leuven	2010 2011
Geodetic reference systems	IGN France, LAREG	2011 2012
3D urban modelling	IGN France	2011 2012
Radiometric performance of digital photogrammetric cameras and laser scanners	Finnish Geodetic Institute, TU Vienna	2012 2013
Open standards & Open source web mapping	ITC – Univ. of Twente	2012 2013
High-density image matching	IPF Stuttgart Univ.	2013 2014
Integrated use of airborne laser scanning and aerial photogrammetry	Aalto Univ.	2013 2014
Mapping using high-resolution satellite imagery	Terra Messflug GmbH	2014 2015
Change detection in high-resolution land use/cover geodatabases (at object level)	IGN France	2014 2015
RPAS in land survey – theory and practice	Univ. of Rostock, IPF Stuttgart Univ.	2015 2016
International standards for geographic information	Univ. of Applied Sciences Neubrandenburg	2015 2016

Table 2. Past EduServ topics (2002–2016)

Today, requests for EduServ topics are numerous. They come from academia, research institutions, NMCAs, other public institutions, and the private sector. These users also influence, through the Board of Delegates, the EuroSDR research topics; therefore, the e-learning topics remain closely linked to EuroSDR research projects. As a result, past EduServ topics also reflect the research and development areas that were or are of high interest to the geospatial domain during a particular period (Table 3). Tutors are recruited from EuroSDR project leaders or from universities with experience in the selected topic and e-learning. EuroSDR continues to work with past course tutors to ensure that this valuable resource is maintained as an effective and sustainable archive.

Course title	Tutors and Affiliation	Years
RPAS in land survey – theory and practice	<i>Görres Grenzdörffer</i> , Univ. of Rostock; <i>Michael Cramer</i> , IPF Stuttgart Univ.	2015 2016
International standards for GI	<i>Wolfgang Kresse</i> , Univ. of Appl. Sci. Neubrandenburg	2015 2016
3D city modelling	<i>Jantien Stoter</i> , <i>Ravi Peters</i> , <i>Hugo Ledoux</i> , TU Delft	2016 2017
SAR for mapping applications	<i>Olaf Hellwich</i> , TU Berlin	2016 2017
Terrestrial point cloud for forest modelling	<i>Liang Xinlian</i> , <i>Juha Hyypä</i> , <i>Yunsheng Wang</i> , Finnish Geospatial Research Institute	2017 2018
Oblique aerial camera systems for mapping purposes	<i>Fabio Remondino</i> , <i>Isabella Toschia</i> , FBK Trento; <i>Francesco Nex</i> , ITC, Univ. of Twente; <i>Markus Gerke</i> , TU Braunschweig	2017 2018
Automatic topographic mapping through description & classification of RS imagery	<i>Joachim Höhle</i> , Aalborg Univ.; <i>Sébastien Lefèvre</i> , <i>Bharath Bhushan</i> , <i>Damodaran</i> , IRISA, Univ. Bretagne Sud	2018 2019
Open spatial data infrastructures	<i>Bastiaan van Loenen</i> , TU Delft; <i>Joep Crompvoets</i> , KU Leuven; <i>Lars Bernard</i> , TU Dresden	2018 2019
3D sensing, scene reconstruction and semantic interpretation	<i>Martin Weinmann</i> , <i>Boris Jutzi</i> , Karlsruhe Institute of Technology; <i>Michael Weinmann</i> , Univ. of Bonn; <i>Franz Rottensteiner</i> , Leibniz Univ. Hannover	2019 2020
Deep learning for remote sensing	<i>Loïc Landrieu</i> , IGN France; <i>Sébastien Lefevre</i> , IRISA, Université Bretagne Sud, <i>Bertrand Le Saux</i> , ONERA	2019 2020
GeoBIM – Basic principles and use cases	<i>Claire Ellul</i> , Univ. College London; <i>Lars Harrie</i> , <i>Pera Olsson</i> , Lund Univ.	2020 2021
Spatial linked (open) data	<i>Erwin Folmer</i> , <i>Stanislav Ronzhin</i> , <i>Rob Lemmens</i> , ITC, Uni. of Twente; <i>Wouter Beek</i> , VU Univ., Triply	2020 2021
Recent LiDAR technologies	<i>Gottfried Mandlbürger</i> , TU Vienna	2021 2022
Working with volunteered and crowdsourced GI	<i>Peter Mooney</i> , Maynooth Univ.; <i>Levente Juhász</i> , Florida International Univ.	2021 2022
Integration of 3D city models and BIM: GeoBIM	<i>Francesca Noardo</i> , <i>Ken Arroyo Otori</i> , TU Delft	2022 2023

3D point cloud classification for mapping purposes	<i>Michael Koelle</i> , <i>Norbert Haala</i> , Univ. of Stuttgart; <i>Fabio Remondino</i> , FBK Trento	2022 2023
Remote sensing and change detection with Sentinel time series data	<i>Krištof Oštir</i> , <i>Bujar Fetaj</i> , <i>Matej Račić</i> , Univ. of Ljubljana	2023 2024
Sustainable business models for open geospatial data	<i>Joep Crompvoets</i> , KU Leuven; <i>Frédéric Cantat</i> , IGN France)	2023 2024
From traditional to AI-based 3D scene capture and modelling	<i>Michael Weinmann</i> , TU Delft; <i>Dennis Haitz</i> , <i>Martin Weinmann</i> , Karlsruhe Institute of Technology	2024 2025
Point cloud processing with laser scanning	<i>Juha Hyypä</i> , <i>Joseph Taher</i> , <i>Matti Lehtomäki</i> , Finnish Geospatial Research Institute	2024 2025
Machine Learning for Earth Observation	<i>Hao Cheng</i> , <i>John Ray (JR)</i> , <i>Bergado</i> , <i>Claudio Persello</i> , ITC, Univ. of Twente	2025 2026
Spatial Data Quality	<i>Joep Crompvoets</i> , KU Leuven; <i>Anouk Huisman-van Zijp</i> , Kadaster; <i>Antonello Rizzo Naudi</i> , Planning Auth.	2025 2026
Fundamentals of Python programming for geospatial applications	<i>Gottfried Mandlbürger</i> , <i>Katharina Riederer</i> , TU Vienna	2026 2027
3D city modelling: creation, standard. and use in urban applications	<i>Ken Arroyo Otori</i> , <i>Jantien Stoter</i> , TU Delft	2026 2027

Table 3. Recent EduServ topics (2016–2026)

3.3 EduServ participants

In recent years, interest in EduServ has increased significantly. Starting with 25 participants in 2002, the average rose to 40 in 2016. Over the past decade, the average was 57, excluding the exceptionally high number in 2026, when 120 participants registered for at least one EduServ course (Figure 4).

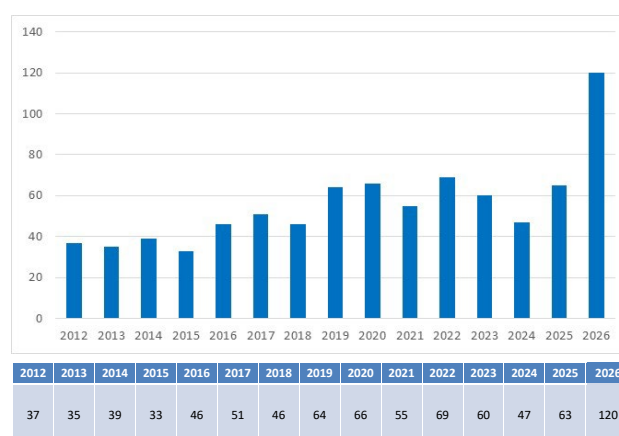


Figure 4. Number of registered EduServ participants for the period 2012–2016.

Participants represent various organisations, mainly national mapping agencies, academia, and research institutions (Figure 5), predominantly from European countries. Most have a geospatial background, but their knowledge and skills vary.

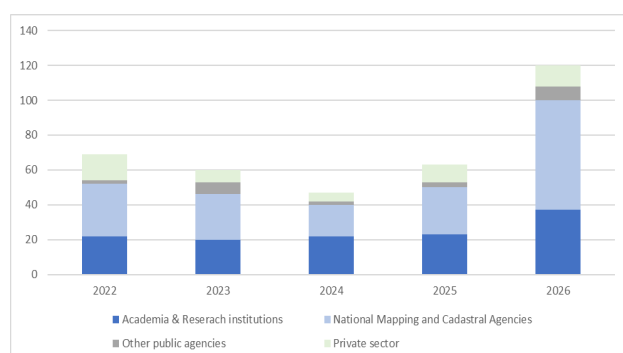


Figure 5. EduServ participants by organisation for the period 2022–2026.

To reach the target audience, EuroSDR aims to announce the annual EuroSDR programme on time, using various media such as the EuroSDR member list, EuroSDR mailing lists, and social media. Participants are asked to inform EuroSDR where they obtained information about EduServ, and over the past decade, it has been observed that the main information sources are EuroSDR members (employers) and the EuroSDR network (email list, colleagues). This typical structure of information sources was also confirmed in 2026 (Figure 6).

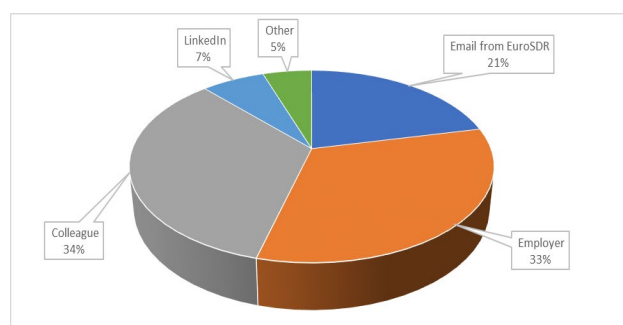


Figure 6. Information source for EduServ courses in 2026, as reported by participants.

3.4 Evaluation of the courses

An evaluation of the EduServ courses is conducted annually based on feedback from EduServ participants, who are invited to complete a short questionnaire after the course ends. Providing feedback is not obligatory, but on average, more than half of active participants respond to the questionnaire. This feedback is highly valuable for EuroSDR, as it is used to improve EuroSDR's education services.

The combination of the introductory seminar and e-learning is viewed positively by most respondents who attended the pre-course seminars. However, in the past five years, only a limited number of EduServ participants have attended the pre-course seminar in person – on average, only 20%. In future, the approach to the pre-course seminar must be reconsidered to make it more attractive, incorporating interactive discussion and identification of individual requirements. The seminar needs to be carefully designed and managed so that participants benefit from attending, justifying the considerable expense and disruption of taking time out of busy work schedules and travelling to the seminar venue.

Feedback on EduServ e-courses over the past five years indicates that, in general, participants find the courses very useful, and most respondents stated that the courses' goals were

achieved. The well-structured content, access to teaching materials via Moodle, and tutors' prompt responses are particularly highlighted. Some participants had difficulty keeping to the schedule and feel the workload is somewhat too heavy. For this reason, tutors are asked to consider that most participants are employed and require flexibility in scheduling meetings and assignments. Furthermore, some participants stated that differences between the courses caused challenges in following them. EuroSDR has guidelines for course design, methods of delivering lectures, and design of self-assessment tools, but flexibility is needed as the course material and didactic approach must be designed with respect to the course content.

In this context, the use of Moodle as an e-learning platform has been confirmed to contribute considerably to the success of the EduServ courses. Course materials and interactive tools in the e-learning environment are highly appreciated. Both EduServ tutors and participants confirmed in their feedback that the tools in the Moodle environment offer many options for organising an e-learning course in a more interactive way. Recently introduced video lectures and live remote meetings have also contributed significantly to the attractiveness of the courses.

Additionally, participants are asked to suggest topics of interest for future e-learning, which is an important resource for planning EuroSDR educational activities. Among the topics of interest for future EduServ courses, respondents recently named RPAS topics with positioning, quality assurance, standards; 3D modelling at the national scale; oblique image processing; hyperspectral data processing; machine learning/deep learning from remote sensing data; AI-based geospatial operations; data integration for combining remote sensing data within GIS platforms; AI-based geospatial analytics and change detection; mobile mapping and data processing; LiDAR data fusion and processing; geospatial digital twins and real-time data integration; services for historical geodata archives; big data processing and cloud computing, etc.

4. Conclusions

The EuroSDR Educational Service, EduServ, is a well-established and internationally recognised annual series of e-learning courses in geospatial information science, covering the entire spatial data and information provision cycle, from data acquisition to maintenance and service delivery. Since its inception in 2002, it has aimed to transfer knowledge from EuroSDR research projects to the wider geospatial community. Over the past decade, however, the topics have extended beyond EuroSDR research projects.

EuroSDR intends to continue its education service to address the challenge of transferring the outcomes of its research activities to the GI production and user domain, and to respond to special requests from academia, NMCAs, and the private sector.

EduServ is unique in reflecting the latest developments in geospatial information science and technology, while also meeting the needs of NMCA personnel for knowledge updates in this field. The growing interest in the diverse range of EduServ courses indicates that ongoing investment in geospatial capacity building is essential for the international GI community. In addition to EduServ courses, EuroSDR has been developing closer collaboration in organising short courses and developing e-learning materials with related associations, such as EuroGeographics and AGILE.

The EuroSDR EduServ programme has proven to be an effective model for geospatial capacity building through distance education, and its experience should be shared more widely beyond Europe to benefit the global geospatial community.

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References

EuroSDR, 2024. Annual Report 2024. European Spatial Data Research.
https://www.eurosd.net/sites/default/files/uploaded_files/eurosd_dr_annual_report_2024_updated.pdf (15 January 2026).

EuroSDR, 2025. EuroSDR Research plan until 2028. Version 1. EuroSDR Secretariat.

EuroSDR, 2026. European Spatial Data Research.
<https://www.eurosd.net> (15 January 2026).

Fritsch, D., Mooney, K., Oestman, A., 2013. The Future of EduServ. White paper. EuroSDR. https://ifpwww.ifp.uni-stuttgart.de/publications/2013/131115_Future_of_EduSERV_final_version.pdf (15 January 2026).

Fritsch, D., 2014. The Future of EduServ. *International Journal of Excellence in Education*, 6, 1. doi.org/10.12816/0010841

Fritsch, D., Mooney, K., Oestman, A., 2012. EduServ – the education service of EuroSDR: sharing experience for capacity building. *Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci.*, XXXIX-B6, 87–90. doi.org/10.5194/isprsarchives-XXXIX-B6-87-2012.

Heipke, C., Kuittinen, R., Nagel, G. (Eds.), 2003. From OEEPE to EuroSDR: 50 years of European Spatial Data Research and beyond. Seminar of Honour. EuroSDR Official Publication No 46.

Höhle, J., 2008. Experiences with combining e-learning courses with face-to-face education. *Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci.*, XXXVII-B6a, 59–64.

Martin, A., Mooney, K., Greenway, I., Davey, J., 2003. The Potential of Distance Learning in meeting the Challenges facing National Mapping Agencies in the new Millennium. In: Proceedings of FIG Working Week 2003, Paris. https://www.fig.net/resources/proceedings/fig_proceedings/fig_2003/TS_18/TS18_4_Martin_et_al.pdf (22 January 2026).

Mooney, K., 2005. EuroSDR's EduServ Series - Transferring Knowledge from the Research to the User Domain by Distance eLearning. *Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci.*, XXXVI-6/W30.

Mooney, K., Martin, A., 2004. The Potential of eLearning in the Spatial Information Sciences - a resource for Continuing Professional Development. *Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci.*, XXXV-B6, 160–162.

Streilein, A., Remondino, F., Pfeifer, N., Trollvik, J.A., Stoter, J., Crompvoets, J., Potůčková, M., 2016. EuroSDR – the pan-

European network for mapping agencies and academia. *Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci.*, XLI-B4, 661–668. doi.org/10.5194/isprsarchives-XLI-B4-661-2016.

UN-GGIM, 2020a. Framework for Effective Land Administration. A reference for developing, reforming, renewing, strengthening, modernizing, and monitoring land administration. https://ggim.un.org/meetings/GGIM-committee/10th-Session/documents/E-C.20-2020-29-Add_2-Framework-for-Effective-Land-Administration.pdf (15 January 2026).

UN-GGIM, 2020b. Future trends in geospatial information management: the five to ten year vision. Third Edition. https://ggim.un.org/meetings/GGIM-committee/10th-Session/documents/Future_Trends_Report_THIRD_EDITION_digital_accessible.pdf (15 January 2026).

UN-GGIM, 2023. United Nations Integrated Geospatial Information Framework. A Strategic Guide to Develop and Strengthen National Geospatial Information Management. Second Edition. <https://ggim.un.org/UN-IGIF/part1.cshtml> (15 January 2026).

Vanden Berghe, I., Mooney, K., 2011. EuroSDR e-learning courses for European Mapping Agencies. In Hubeau, M., Steenberghen, T., Van Balen, K., Van Orshoven, V., Vileikis, O., (Editors): Proceedings of the International Workshop GIS-education in a changing academic environment. Leuven, Belgium, 109–116.