



European Spatial Data Research

December 2020

**EuroSDR Survey:
Initiatives for Providing Data and Tools
for Research and Education**

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Survey Report

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The official publications of EuroSDR are peer-reviewed.

Bucher B., Potůčková M., Cromptvoets J.

“EuroSDR Survey: Initiatives for Providing Data and Tools for Research and Education”

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EuroSDR SURVEY: INITIATIVES FOR PROVIDING DATA AND TOOLS FOR RESEARCH AND EDUCATION

With 8 figures

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1 INTRODUCTION

Geographical data and analysis are a key asset in different domains of education, from primary school to high education and life-long learning, and of research like geography, history, urbanism or environmental science, among others. Engaging with these user communities is part of the mission of many EuroSDR members. It is also a precious investment to improve data value and reusability. Firstly, the education community can give relevant feedback on the data usability from their pedagogical perspectives, scientific users can comment on quality documentation as they need to adopt a critical perspective on results obtained with data and students learn to use such complex data before they go into the work force where they may promote their usage. Second, all these users can help data providers investigate the design of new products to answer emerging needs.

Three commission chairs of EuroSDR (Commission 4 Information usage, Commission 5 Business models and operations and Commission 6 Knowledge transfer) launched a survey on the provision of data and tools for research and education purposes on 13th May 2019. The objective of the survey was to study existing initiatives in terms of practices and projects at EuroSDR organizations to provide data and tools to pupils, students, teachers, and scientists for research and/or education purposes.

A questionnaire was sent to all the delegates of EuroSDR who represent national mapping and cadastral agencies (NMCAs). The respondents were asked to describe their potential initiatives by using a standardized template format, which is in the Annexe 1 of this report. The respondents could describe as many initiatives as relevant for the provision of their data and tools. The deadline was set for 1st July 2019. The answers were compiled and reported in a first draft. As the answer rate was rather low, the draft report was circulated in Spring 2020 again. The first section of this report presents an overview of the results obtained from this survey and the next section presents them more in details using the same structure as the questions of the template.

2 OVERVIEW OF THE RESULTS OBTAINED TO THE SURVEY

2.1 Generalities

Responses from 14 organisations were received that depict altogether 32 initiatives mapped on figure 1.

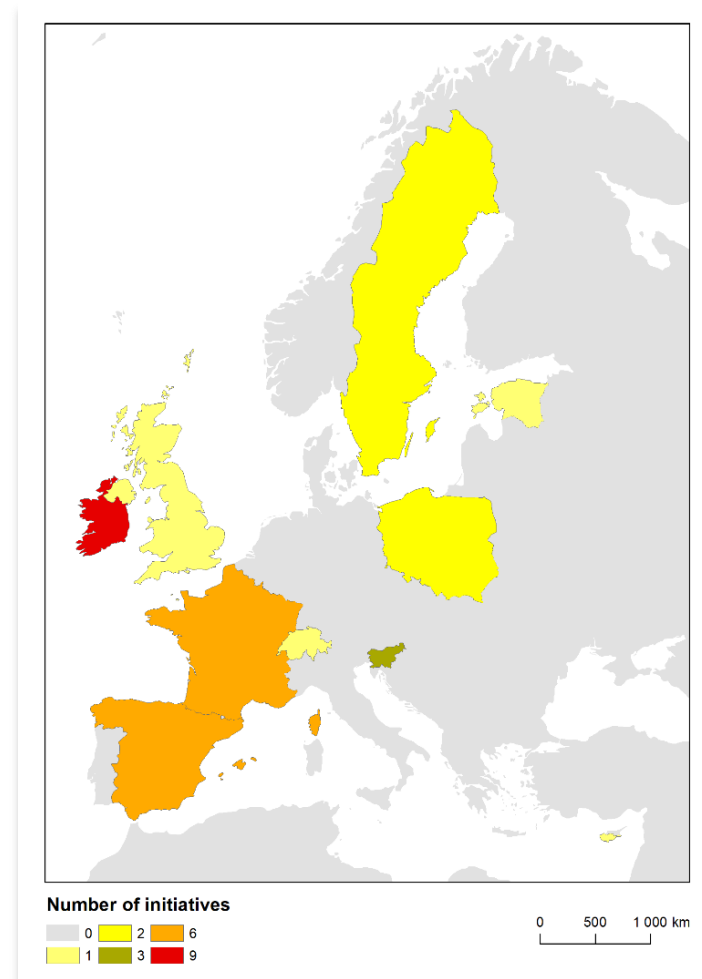


Figure 1: Map of the initiatives depicted in the survey.

We list hereafter the ten mapping agencies also to introduce their possible acronyms.

- Cyprus (Department of Lands and Surveys),
- Estonia (Estonian Land Board),
- France (National Institute of Geographic and Forest Information – IGN France),
- Ireland (Ordnance Survey Ireland – OSi),
- Poland (GUGiK),
- Slovenia (Surveying and Mapping Authority of the Republic of Slovenia),
- Spain (Spanish National Geographic Institute – IGN Spain),
- Sweden (Lantmäteriet),
- Switzerland (Swiss Federal Office of Topography – Swisstopo),
- and United Kingdom (Ordnance Survey UK – OSGB).

In addition, other organisations also responded:

- Marine Institute Ireland,
- Geological Survey Ireland,
- Irish Fisheries Board,
- the Warsaw University of Technology

The kind of resources mentioned are mainly data distributed under a specific licence or through a specific portal. They also include tools to process the data, sensors and specific clients (viewers, story maps editors). There are also teaching material in the specific domains of competence of the agencies which range from multimedia documents to animation and a Geolab truck. The portals or platforms dedicated to education are also used by the education actors to produce and share specific materials in their domains. Apart from specific licences for research, the engagement with research is mainly done through collaborative projects or PhD.

Explicitly mentioned domains are: geography, seismology, volcanology, astronomy, economics, mathematics, physics, computer science, remote sensing, photogrammetry, cartography.

Engaging people is an important aspect in education and the notion of games is often mentioned: the generation of Minecraft data out of topographic databases, the publication of geogames on agencies portals and the organisation of escape games on geographic information science.

Last, most organisation operate an open geodata portal for the general public, which can be used by the education and research community.

3 DETAILED PRESENTATION OF RESULTS OBTAINED TO THE SURVEY

3.1 What and for whom

A diverse range of data and tools for research and/or education purposes are provided. Hereunder, an overview (with examples) is provided.

Open geodata portals for general public (and therefore available for use in education and/or research)

- electronic library of geographic and descriptive information on all real estate in Cyprus [1]
- geoportal of the Estonian Land Board [2]

Specific data portfolio and teaching materials for education on Primary, Secondary and University Level (and research)

- OSi: provides a specific dataset (Large scale data, Archived imagery older than 3 years, Discovery data, Boundary data, Historic mapping, Small scale data, Web services) at no costs based on the National Mapping Agreement for primary, secondary and university level of education; through a Map Viewer the system allows access to approximately 450 datasets from across the public sector under a range of headings such as Agriculture, Environment, Planning and Development, Geology, Health [3]. Figure 2 shows a section of the homepage of Scoilnet Maps – a website offering a wide range of maps for Irish schools.

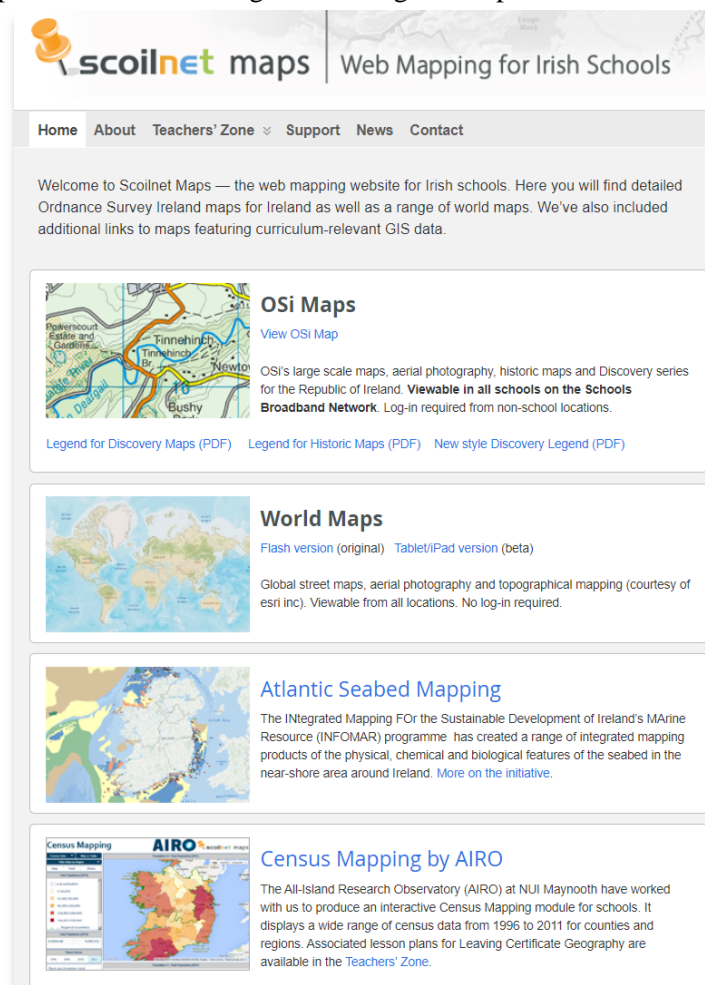


Figure 2: Homepage of Scoilnet Maps offering digital maps for Irish schools [3].

- Irish Marine Institute: Real Map of Ireland (developed lesson plans for primary school teachers to use ‘the real map’ in the classroom as a handy learning tool) [4]
- IGN Spain: Educational materials for training in the field of geography, cartography, photogrammetry, remote sensing, seismology, volcanology and astronomy. The materials are composed of documents, conferences, digital maps, videos, multimedia applications, social media, smart phones applications. All the content is in Spanish, free and available on the internet. [5]
- OSGB: 21 products covering both Great Britain and Northern Ireland are in the portfolio under the Educational Services Provider Contract (ESPC). Under the ESPC the sole permitted purpose is teaching and research and the licensing arrangement ensures that data is free at the point of use. Different services are available from OSGB partners to reflect user abilities and needs, i.e. schools and colleges can access simple browser-based mapping which include essential cartography and analysis tools while advanced college and university users can access more complex browser-based applications as well as data download facilities. [6], [7]
- IGN France: Geocube at School is a project that provide teachers with a toolkit to install a hub of sensors together with their pupils at the school, to load the data into a global platform hosting measures from all Geocubes and to use data from this platform. The associated online map service aims at providing different tools and resources: map, graphs, data processing tools with the Python interface (in French). [8]
- IGN France: On-line service EDUGEO for teachers and students provides different tools and resources (a wide variety of maps) to draw different thematic maps (historic, economic, statistics or story maps...), work on them, and register them for class exercise (in French) [9]. Example of a webpage introducing a dataset focused on visualisation of the growth of urban sprawl on a typical city, shown in Figure 3.

POUR QUOI FAIRE ?

Cas concret : Visualisez l'étalement urbain (Meyzieu, banlieue de Lyon)
 Une approche qui optimise l'acquisition du savoir

1 Affichez la carte de 1947

Meyzieu est encore en 1947 une commune rurale aux marges de la ville. L'essentiel du territoire communal est à vocation agricole, le bâti est assez concentré.

2 Dessinez grâce à l'outil en ligne

L'outil de croquis en ligne permet de tracer rapidement la zone bâtie en 1947. De nombreux outils de dessins sont disponibles.

3 Comparez avec la carte actuelle

La commune a connu une forte explosion démographique dans les années 1970. À l'aide de la carte actuelle, on visualise ainsi cet étalement spatial.

Et aviez-vous aussi remarqué que le «x» final de Meyzieu a disparu ?

[> Tous les autres exemples](#)

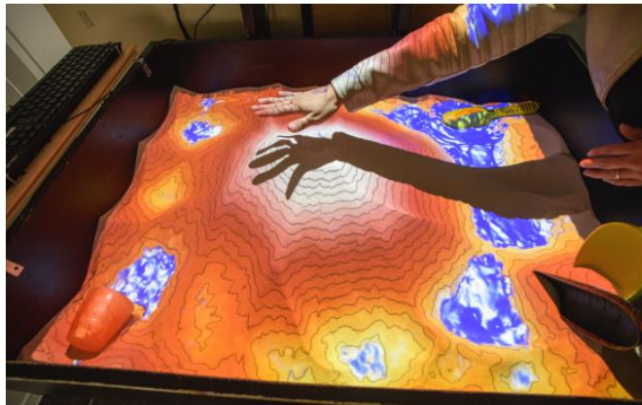
Figure 3: Example from IGN France EDUGEO homepage devoted to visualisation of the growth of urban sprawl (in French: étalement urbain) [9]

- **Swisstopo:** Specific teaching materials are prepared for three education levels:
 - For the primary level: materials to help pupils to learn about different types of geodata, to learn how to read maps and aerial photos and how to use them, to learn the history of Swiss landscape using historical geodata.
 - For the secondary level and high school: a mobile laboratory called SwissGeoLab aiming to bring the world of geomatics closer to pupils and interested citizens through experimental teaching methods, experimental techniques for measuring, analysing and depicting the landscape and showing the connection between geomatics and traditional areas such as geography, history, mathematics, physics, computer science and the map applications. There are also collaborations on master thesis as well as data-contract with universities and teachers for research. [10]

Note that SwissGeoLab material is also used to inform general public about the challenges posed by new technologies and ways of thinking in the profession of geomatics specialists, see Figure 4.

SwissGeoLab

SwissGeoLab is an educational laboratory that aims to give a glimpse of the world of geomatics. It is primarily intended for secondary and high school students and travels around Switzerland from one interested school to another.



The "Sand box and contours" experiment

What is geomatics? How is it linked to geography, physics, computer science or the maps we use to orient ourselves? The mobile Swiss geomatics lab, SwissGeoLab, answers these questions in an entertaining manner through practical experiments, which are designed primarily for secondary and high school students. These experiments are grouped according to the following 6 themes:

- Orientation in space
- Sandbox
- Going back in time
- 3D portrait
- Grandfather's camera
- Geolocalisation

Figure 4: Homepage of the SwissGeoLab, an educational tool for secondary and high school students [10].

- **Slovenia:** E-content, web cartography and geo-multimedia for education of geography and history are prepared for primary and secondary schools in Slovenia.
- **Lantmäteriet:** Geoskolan is a digital teaching support for teachers and students in primary schools (age 6 to 15) and secondary schools (age 16 to 19).
- **Geoskolan** contains lesson ideas, a teacher manual and a map application/viewer with geodata (viewing services) from several public authorities, e.g. demography, groundwater, bedrock, wells, topographic maps, orthophotos, elevation data, protected areas, relic of the past and ancient monument, production and industrial facilities. Lesson ideas in Geoskolan have been

developed based on the knowledge requirements in the syllabuses. Geoskolan is free to use and available on the internet. [11]

- By signing a license agreement schools in different levels can access geodata free of charge from Lantmäteriet and the Geological Survey of Sweden (SGU) for use in the category of use called “Research, Education and Cultural Activities”. Researchers and students can access geodata through a download service. The download service is connected to SUNET, Swedish University computer Network and use a identify federation called SWAMID, Swedish Academic Identity Federation. SWAMID includes most universities, university colleges, research institutions and government agencies that are related to Swedish research and educational sector. Culture institutions contacts Lantmäteriet or SGU to order and access geodata. [12], [13]
- Warsaw University of Technology: CENAGIS – the "Centre for Scientific Geospatial Analyses and Satellite Computations – is an advanced IT infrastructure (cyber-infrastructure) allowing for implementation of geospatial analyses (such as spatial big data with data mining functionality) and satellite computations. Spatial analyses of large areas, such as the entire country, regions, opens new opportunities to perform new types of research works. The basic idea of performed, scientific geospatial analyses is the development of new models and data analysis algorithms to be used by different industries, services and operations performed by public institutions. CENAGIS consists of the scientific repository of geospatial data of Poland, computational centre, and virtual research laboratories with access to open, vector and raster spatial data, for the entire Poland. As a result of cooperation with partners, access to satellite imagery of the European Space Agency (ESA) is ensured. CENAGIS provides the convenient remote access to big sets of spatial data (with the structures developed especially for scientific purposes), as well as an analytical platform dedicated for scientific analyses will be ensured. The Centre is open for cooperation in the field of many kind of geospatial resources, which are being developed in Poland (such as geodetic, road, railway, forest, geological, agricultural, meteorological, planning, architectural, environmental protection, defence data) in order to their common processing, analysing and harmonisation. [14]

Professional training

- IGN Spain: e-learning courses on GIS, Cartography, SDI, Remote sensing etc. (small fee, in Spanish) [15]
- Copernicus user uptake (mentioned by IGN Spain but runs internationally) [16]
- IGN Spain: providing scholarships and 1 to 3 years job after finishing university for preparing new professionals on spatial data.
- IGN France: E-learning courses about geomatics technologies (in French only) [17]
- GUGiK Poland: stationary and e-learning free courses focusing on spatial datasets and functionalities available on national geoportal. Planning training activities and e-learning for public administration on GIS, SDI and geoportal.gov.pl (in Polish only) co-financed from EU funds. [18]



Curso	Ficha	Temario	Prácticas	Fechas	Inscripción: 9 de marzo
Teledetección, Fotogrametría, LIDAR y Ocupación del suelo			SNAP • E-Foto • GlobalMapper • QGIS	20 de abril - 29 de mayo	
Sistemas de Información Geográfica (Básico)			ArcGIS 10.6.1 o QGIS 3.6	20 de abril - 29 de mayo	
Sistemas de Información Geográfica (Avanzado)			ArcGIS Pro	20 de abril - 29 de mayo	
Infraestructuras de Datos Espaciales y Datos Abiertos			GeoServer y QGIS	-	
Cartografía Temática			ArcGIS 10.6	-	

Figure 5: IGN Spain - offer of e-learning courses for professionals in 2020 [15].

Support to teachers

- Geological Survey & ESRI Ireland: collaboration with Junior Cycle Teachers (JCT) Geography to assist teachers with the teaching Geo-literacy skills in the Irish National Curriculum. JCT Geography is a group of teachers with the responsibility to introduce the new Geography specification for Junior Cycle (ages 12 – 15 approx.). The programme has a three (academic) year plan 2018 - 2021 with goals of i) Continuing Professional Development (CPD) days with a focus on using GSI data and maps from our website in the teaching of Geography and to encourage students to use it for their Classroom Based Assessment “My Geography”, ii) Curriculum resource development, iii) Field trip resource development.

Project/theme/research-oriented dataset for general public

- The BlueFish Project: The Ireland Wales Territorial Co-operation project for the Irish and Celtic Sea, focus on climate change, cross border collaboration and community engagement. [19]
- Irish Marine Institute: Ireland’s Marine Atlas (viewer), Seabed Mapping (Interactive Maps, Downloadable Maps, charts, shipwreck imagery, Google Earth KML files, survey and research reports, Story Maps, Real Map of Ireland), Shellfish Data Survey (latest shellfish safety data for harvesting and production maps are based on defined production areas and results analysed by the Marine Institute), Fisheries Resources Map (viewer and data download

- IGN Spain: geogames on their educational portal [5]
- IGN France: On-line service named Minecraft@ on Demand that is designed to provide Minecraft maps from the geographic data of IGN production. This free web service (see Figure 7) enables the user to select the centre of the map and to get a Minecraft world (between 0,5 km and 5km long and 0,5 km to 5km wide, at the scale between 1:1 and 2:1. The player can easily input this map into Minecraft. [26]

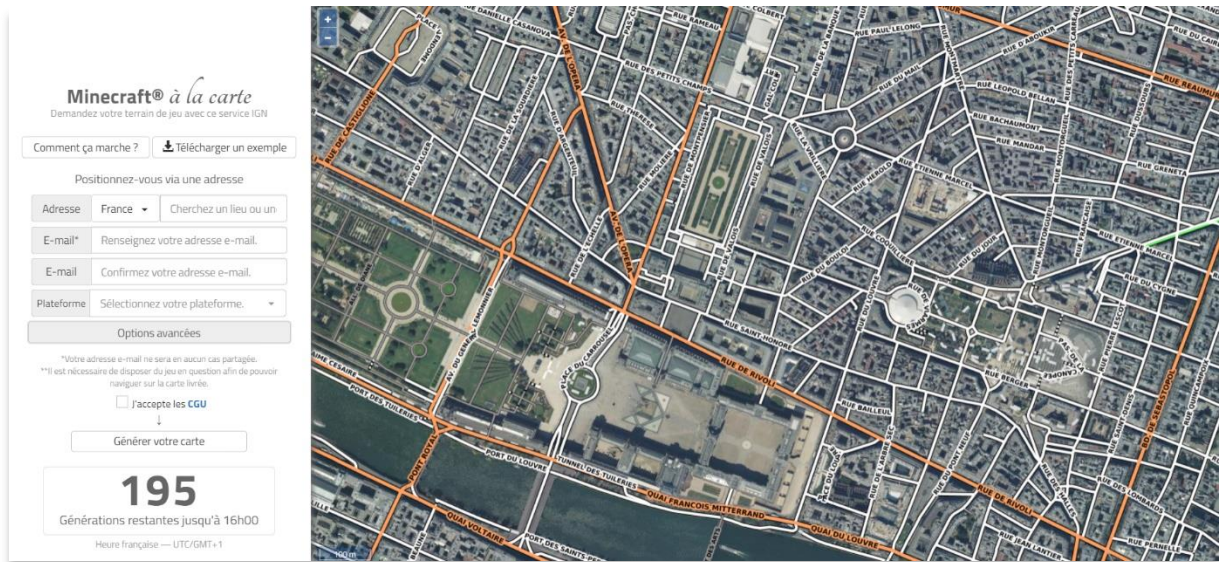


Figure 7: IGN France web service for generation Minecraft datasets[26].

- IGN France: in development - a gaming module based on Minetest (free version of Minecraft) will provide tools to simulate natural risks (floods, rising oceans, eruptions, avalanches, ...) based on geographic data which are provided by the free service Minecraft@ on demand. [27]
- Lantmäteriet: provides open data, in the form of maps for Minecraft covering all 290 municipalities in Sweden. The Minecraft maps are based on Lantmäteriet's national maps and elevation data. The virtual maps include, for example, details of watercourses, lakes, place names, roads, railways, land and forest. The maps also include a teleportation feature to make it easier to find player's city and its neighborhood. The files with the maps can be downloaded in resolution 8 x 8 meters per block; the areas of Gotland (see example in Figure 8), Gävle, Kiruna and Östergötland can be downloaded in the high-resolution of 1x1 meter per block. [28]



Figure 8: Example of 1 x 1 m resolution Minecraft model of Gotland [28].

3.2 Partnerships on educational data and tools provision

The design and provision of such resources is usually grounded on partnerships between NMCAs and other organisations. These are: Ministry of Education, Universities, schools, industry (e.g. ESRI, Hexagon), NMCAs partners e.g. government bodies/departments, national Geological Surveys, European Space Agency.

3.3 Level of Adoption

If mentioned, then level of adoption is usually quoted as very good. Interesting are numbers provided by

- OSGB:
 - Approximate institution subscriptions (individual user numbers):
 - Schools – 2,710
 - Colleges – 190
 - Universities – 120 (annual peak of c. 70,000 active users)
- Minecraft@ on Demand:
 - Available for 3 years, 51 000 maps delivered (50 maps each day)
- eLearning IGN Spain
 - Over 600 students per year
- Lantmäteriet Sweden, Minecraft
 - 28 000 downloads since the start in 2015

3.4 Level of maturity/maintenance

Most of the activities are either regularly updated or new projects under development. Only about 10% activities do not have any funding for maintenance or are time limited.

3.5 Conclusions and perspective

10 different groups of activities supporting education and research were recognised. The target groups cover a wide range from pupils at the age of 5 years to university students, professionals as well as general public. The aims are to teach and improve the geo-literacy, to follow the research and development in geosciences but also to promote the field towards the public. Important part is to foster the fields which are based on geographical data like urbanism and but also to support the access and use of complex data (including geographical data) like climate studies for example. The resources mentioned have updated to online services and applications which support maps downloading, data processing and map making, and also to e-learning courses for professionals on different level of experience. Interesting phenomenon is opening for games adopting real geographical data to virtual environments. Provided learning materials are usually locally oriented regarding the geographical location as well as the language but some steps towards international audience have been made (e.g. e-learning courses or information on the national geoportals in English). Datasets for school and university education are either open or free of charge under a specific licence agreement (e.g. Ireland, UK, Switzerland).

Perspectives can be drawn from this survey for a EuroSDR roadmap on that topic:

- Sharing feedbacks on geodata usability for specific applications in these fields. This could be done thanks to a common questionnaire circulated among users involved in these projects.
- Sharing specific tools used or developed for these projects and enhancing the inter-comparison of these tools and their reuse.
- Identifying new resources that could be achieved through a collaboration between European NMCAAs on that topic.

With respect to the last item, there are possible connections with existing EuroSDR groups like the following:

- Eduserv: to provide an Eduserv course on all these resources, on how to access and apply them, to understand data characteristics and to know where to get information about data characteristics (metadata).
- 3D Group: to promote and accompany the usage of 3D.
- Historical data: to promote and accompany the usage of NMCAAs archives.
- Infolab: to support knowledge exchange related to the usage of geodata.
- Linked Data: to establish links between national data set portals, to support data discovery and reuse.
- VGI: to support pupils editing data or contributing to scientific data.

Acknowledgement

The authors warmly thank all the contributors to the survey and the reviewers, Heather Reese from Lund University and Julián Hernández Delgado from IGN-Spain, for their constructive comments on a first draft.

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- [3] OSi
 - National Mapping Agreement <https://www.osi.ie/services/national-mapping-agreement/>
 - Web mapping for Irish Schools <https://maps.scoilnet.ie/>
- [4] Irish Marine Institute, The Real map of Ireland <https://www.marine.ie/Home/site-area/irelands-marine-resource/real-map-ireland>
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- [7] OSGB Digimap <https://www.ordnancesurvey.co.uk/education/teachers/digimap-for-schools.html>

- [8] IGN France Geocube www.geobservatory.com/
- [9] IGN France Edugéo <https://www.edugeo.fr/>
- [10] Swisstopo educational tools
- Teaching material for Primary School (7 – 13 years)
- School lesson: „Karten lesen“, in german and french online: <https://www.kiknet-swisstopo.org/deutsch/karten-lesen>
 - Teaching material „Das Geheimnis der Steine“: in german, italian and french online: <https://www.kiknet-swisstopo.org/deutsch/geheimnis-der-stein>
 - Website/teaching material: www.schatz-karte.ch
 - www.geo.admin.ch/edu (KOGIS) und www.schoolmaps.ch
- SwissGeoLab for secondary and high school students (13-15 years)
- <https://www.swisstopo.admin.ch/en/services/offer-for-schools/cycle-1/SwissGeoLab.html>
- Collaboration with Master students
- <https://www.swisstopo.admin.ch/en/swisstopo/training/swisstopo-edu.html>
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 - Seabed Mapping <https://www.infomar.ie/maps>
 - Shellfish Safety Data <https://www.marine.ie/Home/site-area/data-services/interactive-maps/select-habs-search-page?language=en>
 - Fisheries resource maps <https://www.marine.ie/Home/site-area/data-services/interactive-maps/fisheries-resource-maps>
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<https://osi.maps.arcgis.com/apps/MapSeries/index.html?appid=acf128d5d4d94f5bbc04ee910139268c>

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- [25] Creating Ireland in Minecraft <https://www.osi.ie/creating-ireland-in-minecraft/>
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- [28] Lantmäteriet Sweden Minecraft <https://www.lantmateriet.se/minecraft>

Annexe 1: Questions asked

The delegates received the following template to describe their initiatives.

DESCRIPTION OF EACH INITIATIVE

What? (provide a short description of your initiative)

E.g.: license, datasets, maps, digital platform to share pedagogic projects, sensors for teachers and pupils, minecraft services, escape games to learn to use data, ...

Target Group? (describe associated user communities including their level of expertise)

Partnership? (incl. your organization, please describe how associated partnerships are arranged)

Level of adoption? (describe the level of adoption of the relevant data and tools by the target group)

Level of maturity/maintenance? (present the level of implementation maturity of your initiative including maintenance aspects)

Perspectives? (future developments)

Url, references? – add relevant reference materials related to the data and/or tools of your initiative