



*European Spatial Data Research*

April 2024

Workshop on Sustainable Business Models  
for National Mapping and  
Cadastral Agencies (NMCAs)

Joint workshop of  
EuroGeographics and EuroSDR  
February 8<sup>th</sup>-9<sup>th</sup> 2024 – KU Leuven, Belgium

Frédéric Cantat, Joep Crompvoets,  
Carol Agius, Matina Fuentes

Official Workshop Report

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“Workshop on Sustainable Business Models for National Mapping and Cadastral Agencies (NMCAs)”

Joint workshop of EuroGeographics and EuroSDR

February 8th-9th 2024 – KU Leuven, Belgium

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# WORKSHOP ON SUSTAINABLE BUSINESS MODELS FOR NATIONAL MAPPING AND CADASTRAL AGENCIES (NMCAs)

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Official Workshop Report

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## **Abstract**

EuroGeographics and EuroSDR held a joint event which aimed to provide an inventory of Business Models for National Mapping, Cadastral and Land Registration Authorities (NMCAs).

NMCAs have an important role, providing geospatial data that are the backbone of social, economic and environmental services of the countries and territories they serve. All geospatial agencies are facing increasing challenges: limited resources, financial constraints, rapid technological advancements and legislative/national obligations, and competition from challengers from alternative providers of tools and services.

EuroSDR and EuroGeographics invited NMCAs, researchers and policy makers to present, discuss and share their experiences during a workshop on 8-9 February 2024. The aim was to provide an inventory of which Business Models NMCAs have implemented, are implementing or will plan to implement to adapt themselves to complete their assignments.

Renowned experts from EuroGeographics and EuroSDR presented and discussed their case studies, issues and challenges. Valuable experiences and information from different NMCAs concluded in a very fruitful debate.

## **Acknowledgement**

The workshop was hosted by KU Leuven with the support of the EuroSDR's secretariat.

The workshop owes its success to the diligent guidance and commitment of a knowledgeable program committee. Their expertise and dedication were instrumental in bringing this event to fruition.

### Program committee

Carol Agius, EuroGeographics

Matina Fuentes, EuroGeographics

Joep Crompvoets, Professor Information Management in the Public Sector, KU Leuven,  
Vice-President of EuroSDR

Frédéric Cantat, IGN France,

Chair of EuroSDR's commission on Business Models and Operations

## 1 Introduction

National Mapping and Cadastral Agencies (NMCAs) have an important role, providing geospatial data that are the backbone of social, economic and environmental services of the countries and territories they serve. All geospatial agencies are facing increasing challenges: limited resources, financial constraints, rapid technological advancements and legislative/national obligations, and competition from challengers from alternative providers of tools and services.

For EU NMCAs' players, the European Commission implementing regulation 2023/138 laying down a list of specific high-value datasets and the arrangements for their publication and re-use published<sup>1</sup> in January 2023, has officially ratified the fact that NMCAs are enforced to provide geospatial data as open data no later than February 2025 (June 2024 officially but with an extra eight months possible reprieve). This is at a cost to the National Government. "*Open Data is here to stay, more than ever but not without sustainable (co)fundings*" was one of the main shared observations from the survey and the workshop on *Sustainable Open Data Business Models for NMCAs* led jointly by EuroSDR and EuroGeographics in 2021. One of the three further actions identified was to take a step back by studying NMCAs business models in general (cf. report<sup>2</sup> by Frédéric Cantat, Joep Crompvoets, Carol Agius and Angela Baker – EuroSDR's Official publication – 2022).

That's why EuroSDR and EuroGeographics invited NMCAs, researchers and policy makers to present, discuss and share their experiences during a dedicated workshop on February 2024 8<sup>th</sup> and 9<sup>th</sup>. This activity seeks to provide an inventory of which Business Models NMCAs have implemented, are implementing or will plan to implement to adapt themselves to this open data environment:

- Do they have to find extra-funding (e.g., fundings that are not State subsidy for public service charge nor reuse fees)?
- Do they have to alter activities, stopping some activities, to start new ones or to adapt the way they operate others?
- Do they have to build partnerships with new actors?
- How do they manage to integrate new key competences?
- Etc.

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<sup>1</sup> [https://eur-lex.europa.eu/eli/reg\\_impl/2023/138/oj](https://eur-lex.europa.eu/eli/reg_impl/2023/138/oj)

<sup>2</sup> <http://www.eurosdrr.net/publications/survey-report-sustainable-open-data-business-models-nmcas-2022>



## 2 Presentations

The presentations were grouped in two keynotes, one recap of previous workshops on the same workshop and seven feedback's presentations from NMCAs.

### 2.1 Keynotes

**Joep Crompvoets, Professor Information Management in the Public Sector, KU Leuven, and Vice-President of EuroSDR, presented<sup>3</sup> “Business Models at National Mapping and Cadastral Agencies – An introduction”.** He shared a definition from Research/Academia about the concept of Business Models which can be summarised with: “A *business model describes the rationale of how an organization creates, delivers, and captures value*” (Al-Debei, M. M., El-Haddadeh, R., and Avison, D., 2008). The four components (service, financial, organisation and technology domains) of a Business Model were highlighted (see below Figure 1).

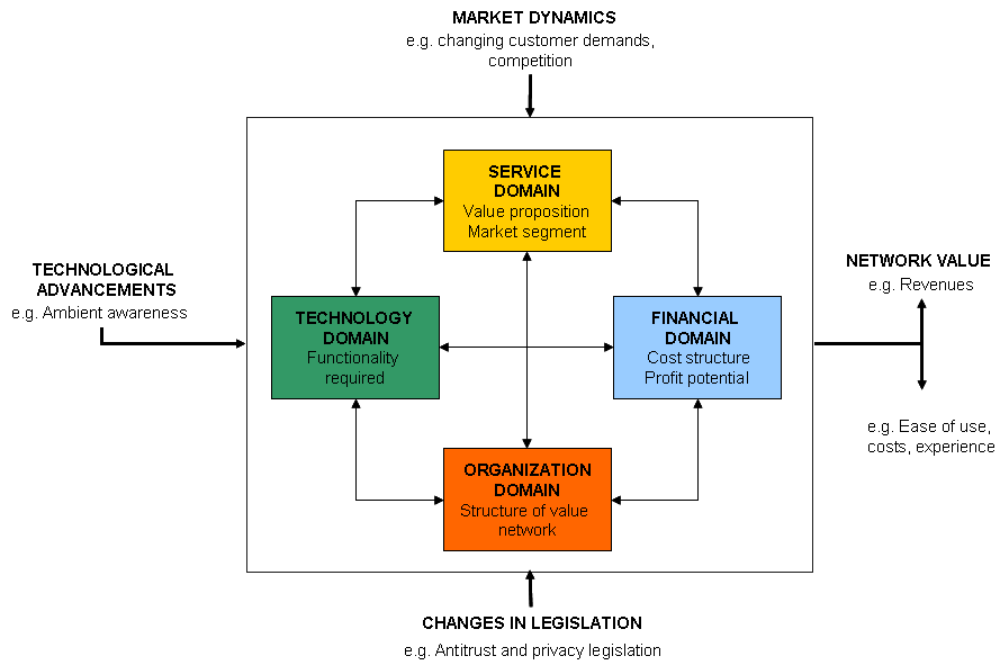


Figure 1: de Reuver, M., H. Bouwman and T. Haaker (2008). Capturing value from mobile business models: Design issues that matter. 21st Bled eConference eCollaboration: Overcoming boundaries through multi-channel-interaction, Bled, Slovenia.

The different types of Business Models were reviewed and illustrated with example(s) from geospatial domain when relevant: Freemium (Ordnance Survey Great-Britain), Licensing (Esri), Open-source (Quantum-GIS), Platform (Uber, applicable for NMCAs?), Subscription (Netflix, applicable for NMCAs?), Advertising model (Google Maps), Ecosystem services (ChatGPT) and others models (Product selling, State budget etc.). Business models are used to develop a business strategy by identifying key attributes of the business and how it creates, delivers and generates value. A business model canvas is a tool which can be used to understand the current and target business model of an organisation: by conducting a situational assessment using the canvas a realistic view of an

<sup>3</sup> See presentation: [https://eurogeographics.org/app/uploads/2023/11/1.-Keynote-Business-Models-for-NMCAs\\_JCrompvoets.pdf](https://eurogeographics.org/app/uploads/2023/11/1.-Keynote-Business-Models-for-NMCAs_JCrompvoets.pdf)

organisation's current operating environment can be built and set the basis for developing the desired business model with a clear understanding of the challenges and opportunities, resource mobilisation and investments, and how these will evolve during the process of developing or strengthening geospatial information management. The participants of the workshops were also invited to discuss and challenge the proposal of a generic Business Model canvas for NMCAs (see below figure 2).

<b>Key partners</b> <ul style="list-style-type: none"><li>- Government</li><li>- Cities &amp; municipalities</li><li>- Local self-governments</li><li>- Academia</li><li>- NGOs</li><li>- Private sector companies</li><li>- Citizens</li><li>- International partners</li></ul>	<b>Key activities</b> <ul style="list-style-type: none"><li>- Producing geospatial information</li><li>- Managing geospatial information</li><li>- Distributing geospatial information</li><li>- Add value to geospatial data and services</li><li>- Leading geospatial information in a country</li></ul>	<b>Value Propositions</b> <ul style="list-style-type: none"><li>- Providing and managing authoritative geospatial data of a country</li></ul>	<b>Customer relationships</b> <ul style="list-style-type: none"><li>- Customer facilitation</li><li>- Customer awareness</li><li>- Customer acquisition</li><li>- Customer retention</li><li>- Customer loyalty</li><li>- Customer satisfaction</li><li>- On-demand support</li><li>- Cooperation/Partnerships</li><li>- Automated services</li><li>- Self-service</li><li>- Co-creation</li></ul>	<b>Customer segments</b> <ul style="list-style-type: none"><li>- Data acquisition</li><li>- Modelling, integration and processing</li><li>- Information usage</li><li>- Visualisation (cartography)</li><li>- Business</li><li>- Knowledge transfer</li></ul>
	<b>Key resources</b> <ul style="list-style-type: none"><li>- Human resources</li><li>- Organizational resources</li><li>- Technological resources</li><li>- Data resources</li><li>- Communication resources</li></ul>		<b>Channels</b> <ul style="list-style-type: none"><li>- Data value chain</li><li>- Communication channels</li><li>- Sales channels</li><li>- Research &amp; Development</li></ul>	
<b>Cost structure</b> <ul style="list-style-type: none"><li>- Organizational costs</li><li>- Operational costs</li><li>- Investment costs</li></ul>			<b>Revenue streams</b> <ul style="list-style-type: none"><li>- State budget</li><li>- Financial loans/grants and donations</li><li>- Service (SLA)/licensing fees</li><li>- Intellectual property revenues (royalties, patents)</li><li>- Membership fees</li><li>- Crowdfunding</li><li>- Others (sales, subscriptions, marketing, taxation)</li></ul>	

Figure 2: proposal for a generic Business Model canvas for National Mapping and Cadastral Agencies inspired by Alex Osterwalder and Yves Pigneur works (2011)

In the final part of the keynote presentation, Joep Crompvoets engaged the participants to challenge several statements: *“The performance of your NMCA business models is...”* (‘strong in the past, moderate or weak for the future’ was the most quoted answer); *“In order to implement strong business models at NMCAs, there is a strong need for...”* (‘clear rules and working structures’ and ‘profound cooperation’ were quoted equally); *“The main beneficiary of a strong NMCA-Business model is...”* (‘public sector’ and ‘society’ were equally the most quoted answers); *“The main bottleneck for implementing a strong business model at NMCA is...”* (balanced answers with ‘political’, ‘financial’ and ‘legal’); *“The main Business Model currently applied at NMCAs is...”* (the most quoted answer was ‘state budget’ mixed with balanced answers with ‘freemium’, ‘open-source’, ‘product selling’). And last statement: *“The Business Model of NMCAs is in danger”* (balanced answers with ‘partly agree’ and ‘not agree’).

**Frédéric Cantat, IGN France’s referent for collaborative innovation and collective intelligence and chair of EuroSDR’s commission on Business Models and Operations**, proposed to the attendees a journey to the roots of openness<sup>4</sup>. There is not one single view when you are talking about openness and to be aware of all roots and trends matters when you are talking about openness with someone, the question mark being *“which is (are) the main driver(s) of my interlocutor?”*. The motivations could be multiple: accountability and transparency (duty of), citizen participation, ideological, political, economic, social and environmental, cooperation, etc. These motivations could be grouped in four categories: accountability and transparency, science & environment, digital and internet revolutions, and, socio-economic and innovation leverages (see below figure 3).

<sup>4</sup> See presentation: <https://eurogeographics.org/app/uploads/2023/11/Keynote-A-journey-to-the-roots-of-Openness-Frederic-Cantat-1.pdf>

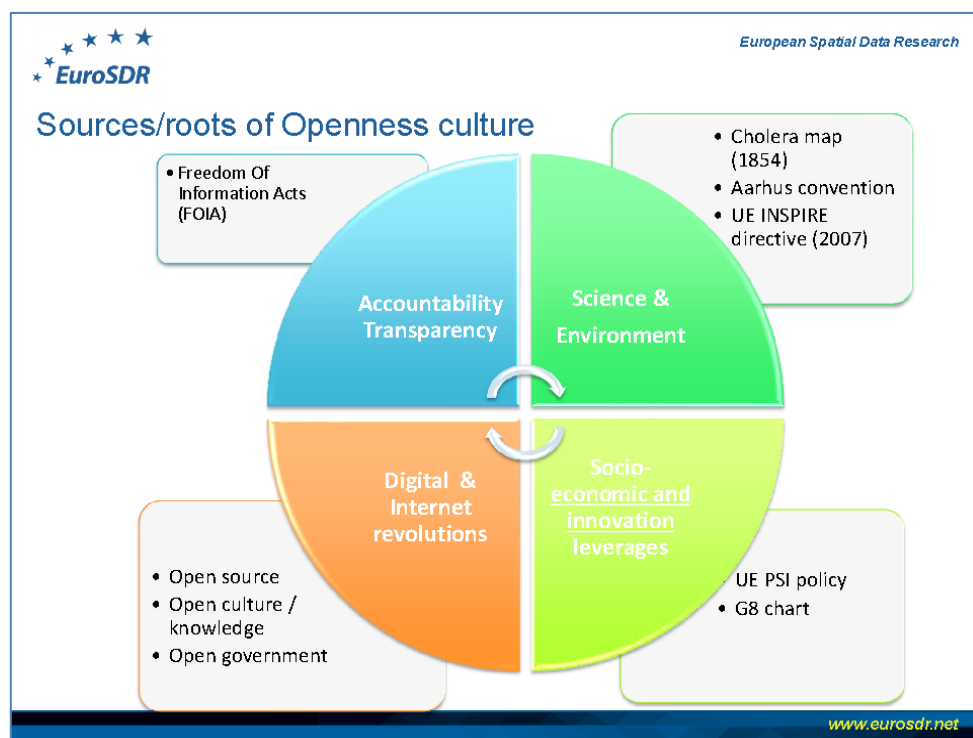


Figure 3: the four roots of openness culture

**The accountability principle in politics and access to public service** (international movement for freedom for information) started in Sweden in 1766 with *His Majesty's Gracious Ordinance Relating to Freedom of Writing and of the Press* proposed by Anders Chydenius, a priest and a member of the Swedish Riksdag (Swedish parliament): "*Without freedom of information, including access to documents, there is no accountability and without accountability there can be no democracy*". Later, the Article 15 of 1789 France's Declaration of Human and Civil Rights stated that "*Society has the right to ask a public official for an accounting of his administration.*". Much later (1967), the first 'modern era' national Freedom of information act was published in the USA.

**The science and environment** (health, environment, climate change domains, etc.) driver started when Sciences and Nature Museums opened and provided free access to the public to their natural collections and knowledge (in 1759 for The British Museum or in 1793 for The French Museum). Later (1854), thanks to a dot map of cholera cases, John Snow traced the source of the disease outbreak, a public water pump on Broad (Broadwick) Street in Soho, revealing the power of mapping and access to information. The first occurrence of the term "open data" can be found in "*On the full and Open exchange of scientific*", a publication of the American National Academy of Sciences in 1995 (also referring to OECD works) and aiming to give access to Earth Observation's satellite contents: "*(...) International programs for global change research and environmental monitoring crucially depend on the principle of full and open exchange (i.e., data and information are made available without restriction, on a non-discriminatory basis, for no more than the cost of reproduction and distribution (...))*".

The movement continued with The United Nations Economic Commission for Europe (UNECE) Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (as known as the Aarhus Convention). It was signed on 25<sup>th</sup> June 1998 in application of United Nations' Rio Declaration on Environment and Development (notably principle 10 and articles 4 & 5). And ended so far in Europe with the Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE).

**The Digital and internet revolutions** branch of the openness culture is a long story and came up on a fertile soil: with commons governance and fights against enclosure and appropriation: from “*The Tragedy of the Commons*”’s Garret Hardin article (Science-1968) to Elinor Ostrom works (2009 Economic Sciences Nobel Prize) passing by American counter culture of the 60s and 70s, with for instance, *The Whole Earth Catalog* by Steward Brand (the man who “*was convinced that seeing an image of the whole Earth would be transformative*” and who campaigned since 1966 “*to have NASA release the then-rumored satellite image of the entire Earth as seen from space*”).

Richard Stallman, American free software movement activist and programmer, launched the GNU Project in September 1983 to write a Unix-like computer operating system composed entirely of free software. GNU is a recursive acronym meaning “GNU is Not UNIX”. He founded the non-profit organization called FSF on October 4<sup>th</sup> 1985, to support the free software movement, with the organisation's preference for software being distributed under copyleft (“share alike”) terms. The Open « source » family is today a large ecosystem, using several series of licences from copyleft (GNU GPL...) to permissive ones (BSD, MIT, Apache...).

Another momentum was The Sonny Bono (the U.S. representative for California's 44<sup>th</sup> district) Copyright Term Extension Act (CTEA) also known as ‘the Mickey Mouse extension Act’ (1998) and the Eldred v. Ashcroft Decision (2001) by the Supreme Court of the United States. The practical result of this act was to prevent a number of works from entering the public domain in 1998 and following years. For Eric Eldred, Larry Lessig (his representant) and other, the Mickey Mouse Act, was a major risk to kill in the bud all the creativity of internet, based on remix (see *Free Culture* by Lawrence Lessig). After they were defeated, Lessig and others came up with an idea. They created a non-profit organisation called Creative Commons and, in 2002, they published the Creative Commons licenses—a set of free, public licenses that would allow creators to keep their copyrights while sharing their works on more flexible terms than the default “all rights reserved.”. Two years after, Rufus Pollock, a British economist, activist and social entrepreneur funded the Open Knowledge Foundation (2005) and stated the the Open Definition (2005), giving sense to ‘open’ (data, content, knowledge) in the Digital Age: “*Open data and content can be freely used, modified, and shared by anyone for any purpose.*”

Then there was a kind of feedback loop with transparency with the Sunlight Foundation (founded in 2006 “*to make American government and politics more accountable and transparent to all*”) the famous “Sebastopol meeting” hosted by O’Reilly & Associates (7<sup>th</sup> and 8<sup>th</sup> December 2007: Carl Malamud, Tim O’Reilly, Lawrence Lessig, Aaron Schwartz and others attended): a shift from Open Government to Open Government Data settling the eight open government data principles (Complete, Primary, Timely, Accessible, Machine processable, Non-discriminatory, Non-proprietary and License-free).

During his 2008 campaign for Presidency Barack Obama embraced theses principles. First founded by USA and Brazil, and after with a steering committee of eight governments (Brazil, Indonesia, Mexico, Norway, the Philippines, South Africa, the United Kingdom, and the United States) and civil society organisations launched in September 2011 the Open Government Partnership (OGP). OGP contained eight action plans, the one led by the United-Kingdom was on Open Data (UK government worked with Tim Berners-Lee -an English computer scientist best known as the inventor of the World Wide Web and also famous for his *The next web* TED’s conference when he made attendees shout “*Raw Data Now!*”<sup>5</sup>- and Professor Nigel Schadbolt for that). Less than two years later (June 2013) was signed the G8 Open Data Charter during Lough Erne (Northern Ireland) Leaders meeting with its five Open Data principles (Open data by Default; Quality and Quantity; Usable by all; Releasing Data for improve governance; Releasing Data for innovation) and its three collective actions of with “*Release of High Value Data*” (fourteen Data categories quoted and among them the four following ones: Earth observation, Geospatial, Energy and Environment, Transport and Infrastructure).

Last, **the socio-economic and innovation leverages** were clearly the focus points of the Public Sector Information (PSI) policy of the European Commission. In Directive 2003/98/EC of the European

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<sup>5</sup> See [https://www.ted.com/talks/tim\\_berniers\\_lee\\_the\\_next\\_web](https://www.ted.com/talks/tim_berniers_lee_the_next_web)

Parliament and of the Council of 17 November 2003 on the re-use of public sector information, recital 1 stated that *“The Treaty provides for the establishment of an internal market and of a system ensuring that competition in the internal market is not distorted. Harmonisation of the rules and practices in the Member States relating to the exploitation of public sector information contributes to the achievement of these objectives.”*. Recital 3 of the Directive 2013/37/EU of the European Parliament and of the Council of 26 June 2013 amending Directive 2003/98/EC on the re-use of public sector information indicated that *“Open data policies which encourage the wide availability and re-use of public sector information for private or commercial purposes, with minimal or no legal, technical or financial constraints, and which promote the circulation of information not only for economic operators but also for the public, can play an important role in kick-starting the development of new services based on novel ways to combine and make use of such information, stimulate economic growth and promote social engagement.”*. Last but not least, in Directive (EU) 2019/1024 of the European Parliament and of the Council of 20 June 2019 on open data and the re-use of public sector information (recast) the recital 69 said *“For the purpose of ensuring their maximum impact and to facilitate re-use, the high-value datasets should be made available for re-use with minimal legal restrictions and free of charge.”*. Finally, the Commission implementing regulation (EU) 2023/138 of 21 December 2022 laying down a list of specific high-value datasets and the arrangements for their publication and re-use, adopted on 21<sup>st</sup> December 2022 gave details for the datasets included in the six categories of High Value Data (1. Geospatial 2. Earth observation and environment 3. Meteorological 4. Statistics 5. Companies and company ownership 6. Mobility) and conditions for their dissemination. Recital 2: *“The main objective of establishing the list of high-value datasets is to ensure that public data of highest socio-economic potential are made available for re-use with minimal legal and technical restriction and free of charge.”*

## 2.2 Recap from previous workshops

**Frédéric Cantat, IGN France’s referent for collaborative innovation and collective intelligence methods and chair of EuroSDR’s commission on Business Models and Operations** did a recap of three previous workshops:

- Sustainable Open Data Business Models for NMCAs – 18-19 September 2017 (Delft, The Netherlands)
  - Sustainable Open Data Business Models for NMCAs – 2-3 February 2022 (Online)
  - Data ecosystems and Spatial Data Infrastructure – 12-13 December 2023 (Copenhagen, Denmark),
- The context, the highlights of the agenda and the main takeouts were shared<sup>6</sup> with the participants.

## 2.3 Feedback’s presentations from NMCAs

**Clément Godin, Policy Officer for European and International Relations within the Direction of Programmes and Support to Public Policies at IGN France and Permanent Correspondent to EuroGeographics** presented<sup>7</sup> how IGN-France’s business and funding model is evolving with the introduction of open data. With data free of charge as of January 1<sup>st</sup> 2021, IGN had to reinvent its business model with its commercial revenues declining rapidly. From a model driven by grant and sales: “Grant for public service charge” not assigned to specific activities, balancing the IGN budget,

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<sup>6</sup> See presentation: [https://eurogeographics.org/app/uploads/2023/11/4.-Recap-from-previous-workshops\\_Frederic-Cantat.pdf](https://eurogeographics.org/app/uploads/2023/11/4.-Recap-from-previous-workshops_Frederic-Cantat.pdf)

<sup>7</sup> See presentation: [https://eurogeographics.org/app/uploads/2023/11/3.-20240208\\_EG-EuroSDR\\_Sustainable-Business-Models-for-NMCAs\\_IGN-FR.pdf](https://eurogeographics.org/app/uploads/2023/11/3.-20240208_EG-EuroSDR_Sustainable-Business-Models-for-NMCAs_IGN-FR.pdf)



completed with specific works fees and professional market incomes. To a model driven by project funding: “Grant assigned to core services only (geodesy production, training programme...)”; Data opened since 2021, which implicated loss of royalty income, not compensated by the grant but obtaining specific funding for new projects beforehand. This is still processing. And the French Agency had to prospect new partnerships to make IGN-France’s funding model sustainable in this new context: new communities with its Geo-commons strategy and the Geo-commons Fabrique; start-ups and SMEs with its incubator *IGNfab*; private companies with ‘Datalliance’ strategy to implement IGN France response to sponsors’ needs, more quickly and with greater innovation, to remove technological or capacity barriers, and by teaming up with companies that have already developed technologies that currently miss. And to focus on networking gathering an exchange group with companies selected for their capacity to innovate with scale-up issues. This evolution is summarized (see figure 4 below):

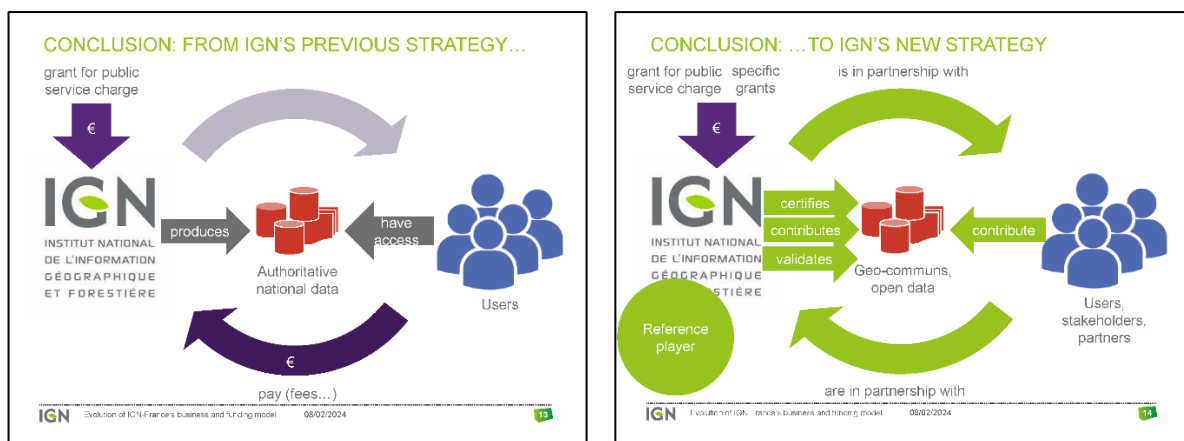


Figure 4: comparative evolution of IGN France strategy in an open data context

**Peter Knudsen, Chief Advisor at Agency for Data Supply and Infrastructure (SDFI, Denmark)** shared<sup>8</sup> the experience of the Danish Agency in Basic Data ecosystem. With Basic Data in Denmark, a shared infrastructure ensures that basic data are accessible and easy to use by the public and private sector. The focus for now is on information about individuals, businesses, real properties and geography. A number of registers have been modernised to ensure that they conform to the same technical requirements and are compatible, easing their integration into new and existing digital procedures.

The most important objectives for the provision of basic data are as follows: 1. Basic data need to be as correct, complete and up-to-date as possible. 2. All public authorities must use the shared public-sector basic data instead of local copies or alternative data sets (which can get out-of-sync). 3. As far as possible, basic data (excluding sensitive personal data) must be freely available to businesses and the public. 4. Efficient distribution of Basic Data, in a way that accommodates user needs. SDFI gets a new role as the Basic Data authority to ensure a professional operation and development of Basic Data in Denmark, which now is a key element in the critical infrastructure for digitization. Common Basic Data has a proven track record as a driver for growth and efficiency in Denmark. It is in an international context quite uniquely made available through a coherent data model across data domains through one distribution platform free of charge. SDFI goes into the different approaches, cooperation models and business models the agency uses to complete the common tasks within the strategic framework for the

<sup>8</sup> See presentation: <https://eurogeographics.org/app/uploads/2023/11/5.-EuroSDR-presentation-08022024-PeterKnudsenSDFI.pdf>

future of Basic Data, where some of the main focus areas are data quality, distribution, partnerships, ecosystems and the binding cooperation across different actors in the public sector.

## Strategic framework for development of basic data

FOCAL POINTS / PHASES	CONSOLIDATION	FURTHER DEVELOPMENT	FREMTIDSUDSIGT
FOCUSED DISTRIBUTION	<ul style="list-style-type: none"> <li>Improvements of the existing distribution</li> <li>Data formats</li> </ul>	<ul style="list-style-type: none"> <li>Completion of re-tendering</li> <li>An analysis of the distribution landscape</li> <li>Compiling data</li> </ul>	<ul style="list-style-type: none"> <li>New technologies</li> </ul>
AN OPTIMIZED DATA MODEL	<ul style="list-style-type: none"> <li>Improved quality of the data model</li> </ul>	<ul style="list-style-type: none"> <li>Unification of model and implementation</li> </ul>	<ul style="list-style-type: none"> <li>More data models</li> </ul>
HIGH-QUALITY BASIC DATA	<ul style="list-style-type: none"> <li>Informative labeling</li> <li>Optimization of data quality</li> </ul>	<ul style="list-style-type: none"> <li>Improvement of data quality</li> <li>Characteristics of Basic Data</li> </ul>	<ul style="list-style-type: none"> <li>An expansion of Basic Data</li> <li>New types of data</li> </ul>
A BINDING COLLABORATION	<ul style="list-style-type: none"> <li>An evaluation of governance and operating processes</li> </ul>	<ul style="list-style-type: none"> <li>Division of responsibilities and binding collaboration</li> </ul>	<ul style="list-style-type: none"> <li>Provide infrastructure</li> </ul>
VALUE FOR THE USERS	<ul style="list-style-type: none"> <li>An evaluation of the collaboration with the users</li> </ul>	<ul style="list-style-type: none"> <li>Establish partnerships</li> </ul>	<ul style="list-style-type: none"> <li>Building of ecosystems</li> </ul>

Figure 5: SDFI's strategic framework to develop Basic Data infrastructure and ecosystems

Through new cooperation models and the usage of new technology (e.g., platforms for ecosystems and AI) SDFI is aiming at developing the infrastructure faster and cheaper in order to achieve the overall quality that the future challenges in society calls for in time to implement the needed digital solutions for the twin transition – green transition and digital transition. Some question marks are still pending about it (see Figure 6 below):

## How to take the next steps?

How is it possible to make the shift to a binding business model, where the private sector contributes to the update of public data for the common good?

- incentives, regulation, ?

What are the role of NMCAs and other register authorities?

- building a platform? Do we have the needed competencies?

Can we use AI as a tool in the basis for the cooperation across the public and private sector?

Could and should we build a public-private innovation partnership in order to develop and establish a public-private partnership?

Agency for Data Supply and Infrastructure

Figure 6: SDFI's question marks for the Basic Data's next steps

**Hara Papadaki** is a senior Dipl. Surveyor Engineer, MSc in Geoinformatics and **works in the Geospatial Information Department of the Hellenic Cadastre. She is also a member of the team working Work Package 6 of the OME2 EuroGeographics project.** She highlighted<sup>9</sup> to the workshop's participants the potential benefits of developing a sustainable long-term pan-European strategy about the cadastral data. The Open Cadastral Map (<https://www.mapsforeurope.org/datasets/cadastral-all>), is part of the Open Maps for Europe (OME) project and aims at providing an easy access to open, authoritative, harmonised pan-European cadastral datasets provided by the National Mapping Agencies and Cadastral & Land Registries of Europe (NMCAs).

Upon completion of the on-going Open Maps for Europe project, it is envisaged to establish and operate openly a single pan-European map that would depict the principal cartographic features of the countries, such roads, hydrographic network etc, as well as cadastral maps. For the time being, cadastral map services are available, as a prototype, for only six countries (Czech Republic, Denmark, Poland, Slovenia, Spain and The Netherlands), while there is a plan to add nine more countries within the next two years. Those services pertain, depending on the country, information about administrative units, cadastral parcels (and cadastral zones), buildings (and building parts) and addresses.

The goal of establishing open geospatial data at a pan-European level is to improve decision-making at a trans-national scale and support directly or indirectly a wide range of applications, such as spatial analysis and planning, environmental monitoring, natural resource management, and disaster management across various industries and countries.

All these datasets are identified as High Value Datasets (HVD) and are subject to a set of rules in order to ensure free of charge availability. Moreover, their re-use is associated with the yielding of important benefits to society and the economy, especially in supporting public authorities to carry-out their missions.

Despite the envisaged benefits expected to result from the adoption of the HVD regulation, implementation of and compliance to such a framework is likely to force changes in the business models used by cadastral agencies to sustain their operation. Thus, a survey of the current state of play across European cadastral agencies and an assessment of the potential impacts of the emerging situation are essential actions for dealing with the upcoming challenges.

Besides that, methods and approaches that could be adopted at a more general level in order to exploit existing best practices about geospatial data management and to establish a common framework for applying standardization approaches to homogenize datasets is presented. Developing the open cadastral data strategy (a two-years scheduled project that has started in January 2024, see Figure 7 below) is based on widely used standards and guidelines (e.g. the INSPIRE Directive, the European Strategy for Data and the UN-GGIM strategic pillars). Extending the INSPIRE formats and services in a way that data findability, accessibility, interoperability and re-usability are enhanced also seems to be a way to proceed. In that case, the potential of using common vocabularies, for example, to semantically annotate authoritative cadastral data and other governmental data in order to establish a mature information interoperability level and better serve governments, businesses, and the public, is a field that is worth exploring. The same is true by trying to take advantage of the emerging AI technologies which have become a vibrant domain of development recently. In fact, availability of a wide range of open geospatial data may be an essential enabler for training and developing artificial intelligence systems. Finally, opening up geospatial data at the international level presents new opportunities for enriching geospatial information by incorporating functions such as auto-translation or multilingual presentation of data and information.

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<sup>9</sup> See presentation: [http://www.eurocdr.net/sites/default/files/images/inline/investigating-the-benefits-of-a-paneuropean-cadastral-data-strategy\\_feb\\_2024\\_harapapadaki\\_1.pdf](http://www.eurocdr.net/sites/default/files/images/inline/investigating-the-benefits-of-a-paneuropean-cadastral-data-strategy_feb_2024_harapapadaki_1.pdf)



## Action Plan for developing a pan-European Cadastral Data Strategy

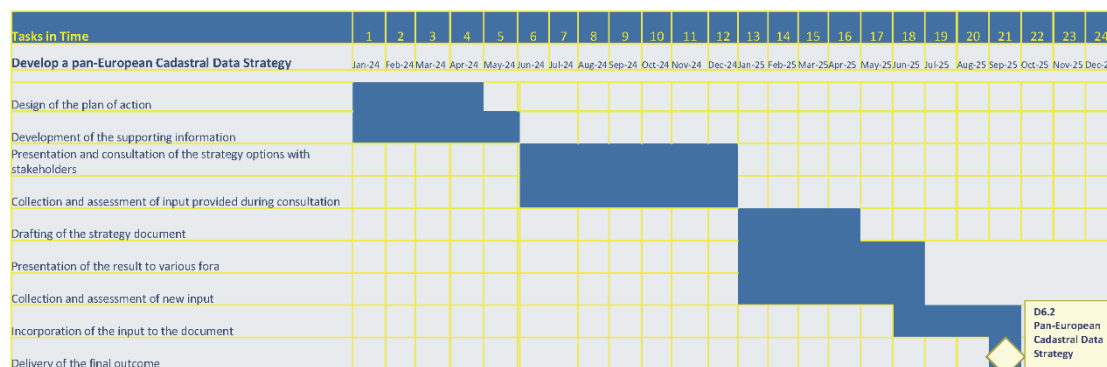


Figure 7: Action Plan for developing a pan-European Cadastral Data Strategy

**Bert Beentjes, Senior Strategy Advisor at Kadaster (The Netherlands)** shared<sup>10</sup> with workshop's attendees the reflection on Business Models that the Dutch agency had to do with the crisis breakouts these past two years. During the second half of 2022 inflation started rising, the real estate market slowed down and the number of mortgage renewals plummeted. This put considerable financial stress on the financial situation of the Dutch Agency. All the budget forecasts have had to be reviewed in emergency, without a ready-made solution. Within the Kadaster, three different business models were set up (see below Figure 8). They all responded differently to the situation of financial stress. The first one was consumer product pricing oriented. The second one was consumer hour pricing oriented. And the third one was budget base oriented. All three had their pros and cons. Business Model 1 (product pricing) is sustainable with reserves, price flexibility, cost flexibility and resilient pricing models. Business Models 2 (hour pricing) is sustainable with volume and Business Model 3 (budget) is sustainable with workload and workforce flexibility, budget flexibility for inflation and alternative revenue streams (e.g. open data provider, user, grant). And a combined Business Model is more resilient than each model on its own.

<sup>10</sup> See presentation: [http://www.eurosd.net/sites/default/files/images/inline/eurosd-business-models-under-financial-stress-kadaster1\\_bert-beentjes.pdf](http://www.eurosd.net/sites/default/files/images/inline/eurosd-business-models-under-financial-stress-kadaster1_bert-beentjes.pdf)



Figure 8: Three possible Business Models to mitigate financial stress

The last observed effects are: reduced investment in improvements leads to slower implementation of regulations and policies; reduced investment in infrastructure leads to vulnerabilities; change from hiring to employing limits future flexibility. On the positive side: more realistic budget agreements and improvements in internal governance.

Bert Beentjes indicated that there are three main takeaways from this live work on financial stress mitigation: financial reserves help to survive the period between the onset of financial stress and mitigation through price or budget increases; cost flexibility is largest in IT development and projects, but limiting developments can have long term consequences for product development or compliance with digital government regulations; cost flexibility in other parts of the work force has to be organised and taken into account in contracts and governance.

**Richard Witmer is product manager topography at Kadaster** (The Netherlands) and handle also, Topography (large and small scale), Imagery and 3D Information. He shared<sup>11</sup> with workshop's attendees his knowhow on maintaining and developing *Basisregistratie Topografie* (BRT), the Key Register Topography in The Netherlands. It encompasses data, maps and webservice. BRT is open data with a fixed budget since 2012 and a 2 years up-to-date legal obligation. There is an increasing customers' demand for new products, services and downloads... with better contents and without... any compensation for higher cost or inflation. How do more and better business with the same budget? Richard Witmer has identified and put into practice several answers: with aerial images and panorama photos, no field visits are needed anymore; fully automatic generalisation and no manual improvements; application of lean management principles in process (see below Figure 9); customer orientation and exchanges with user community (with allowed to focus on their top priority: *"maps up to date, maps up to date, maps up to date! (and maybe sometimes with less information than estimated)"*); new product evolution.

<sup>11</sup> See presentation: [http://www.eurosdrr.net/sites/default/files/images/inline/eurosdrr-workshop-08022023-kadaster2\\_rihard-witmer.pdf](http://www.eurosdrr.net/sites/default/files/images/inline/eurosdrr-workshop-08022023-kadaster2_rihard-witmer.pdf)

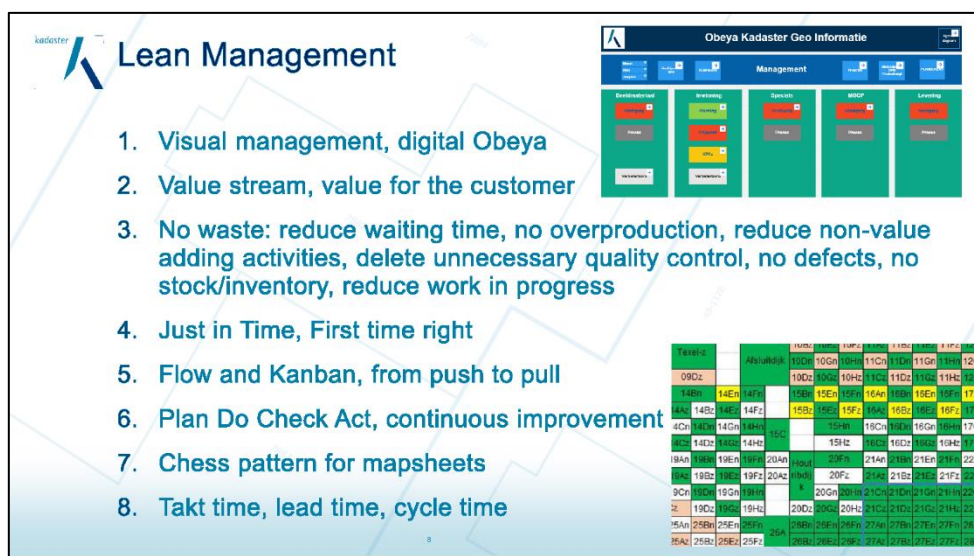


Figure 9: lean management at Kadaster

That allowed the Dutch Agency to launch new products, with encouraging results so far: Topotijdreis.nl (Topo time travel) in 2015, scalable background map for webservices („Google Maps without ads, no track and trace“) and NLMaps.nl, new map scales (1:500k and 1:1.000k) and new data products (geopackage). Customers are happy and employees are motivated. Thanks to lean management (some Kadaster employees received an award for their initiatives) the update cycle downsized from 4 to 1 year, with 80 % reduction in production.

Richard Witmer shared his confidence for the future of BRT thanks to BRT.Next project with 5 items: use of available data from other Key Registers, and from other data sources; single data capture, multiple use; use of new software and technologies (open-source software, cloud computing, Geo AI); future proof: physical and functional objects; and automatic generalisation for high scale products.

**Ingrid Vanden Berghe is General Administrator at IGN Belgium** since 2002 and she is also co-chair of the UNGGIM and part of the executive committee of the UNGGIM Europe since 2020. She shared with the workshop’s attendees the “*paradigm shift of open data and the challenge of sustainable funding for open data producers*”<sup>12</sup>. The business model of many mapping agencies has long been a mixed model with government funding and income based on the sales of data products. Pushed by the conviction that an easy access to governmental data can generate an economic return that is many times bigger, geospatial information is now considered ‘high value data’ (HVD) and has to be made available free of charge. Mapping agencies have to change their business models rapidly to survive the loss of income. In the case of Belgium this is not a walk in the park: to comply with HVD regulation represents a 3 M€ extra costs per year for NGI Belgium (a very thorough study was led to assess the costs) and nobody has this amount of recurrent money currently. Ingrid Vanden Berghe explained that her agency is aiming to become a Geo-broker for public authorities in Belgium (see Figure 10 below), e.g. to be the clearing house for data distribution. For instance, NGI Belgium called for tenders for services, real time traffic and cell phones positions by framework tenders (including all public users with a negotiated price).

<sup>12</sup> See presentation: [https://eurogeographics.org/app/uploads/2023/11/Geo-Broker\\_Ingrid.pdf](https://eurogeographics.org/app/uploads/2023/11/Geo-Broker_Ingrid.pdf)

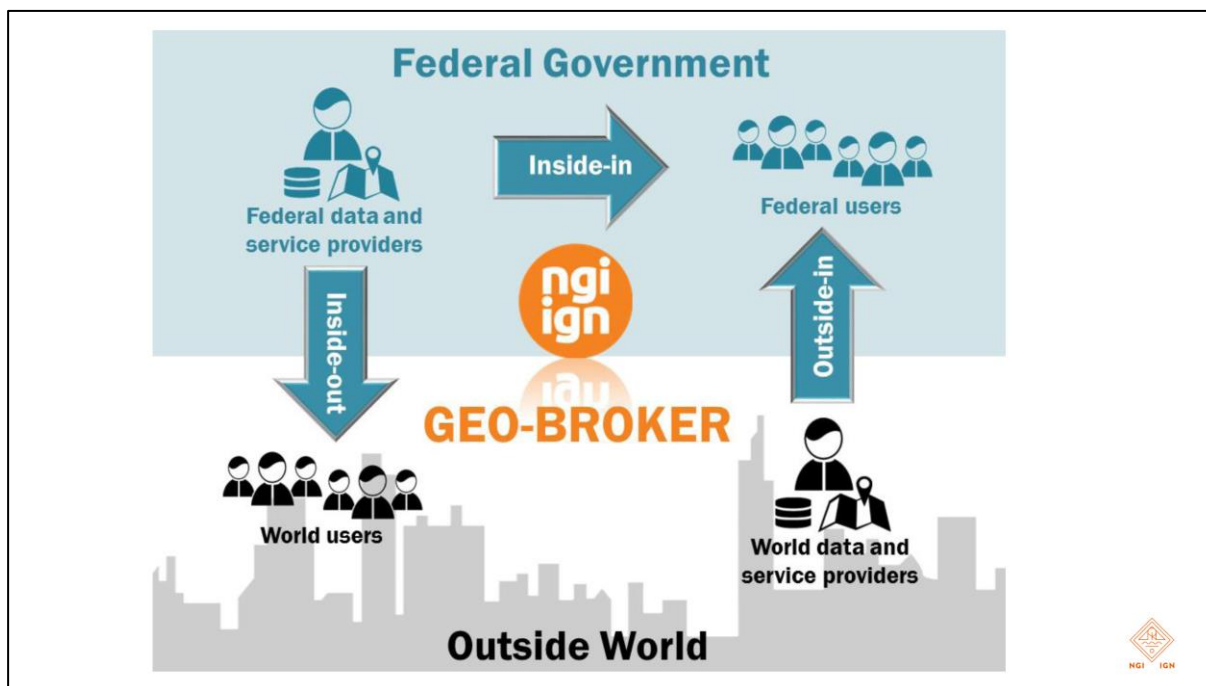


Figure 10: a role of Geo-broker for NGI Belgium

Ingrid Vanden Berghe concluded that developing the “broker” role is part of the (funding) solution but is not enough. Governments have to better understand the need for the reference work of the mapping agencies for sustainable funding to be achieved. According to her, the challenge is how to achieve that understanding.

**Jani Kylmäaho is the Director of Development and Digitalization at National Land Survey (NLS) of Finland.** He shared<sup>13</sup> with the workshop’s attendees the Finnish collaboration model that allows to do more with less. The NLS of Finland together with other public sector agencies has designed an innovative collaboration model indeed. The model enables collection of more aerial image and Lidar data with less cost for the benefit of the whole Finnish society. Aerial image and Lidar data are needed for authoritative geospatial data production. However, same data can be used to map and evaluate the broad forested areas in Finland. The datasets are of major importance also for agriculture, transportation, construction, national defence and for the energy sector to enable the green transition. Finland is a vast country with an area of 390,000 km<sup>2</sup>. Several agencies need up-to-date data for their use. None of the organizations could afford to acquire all the data needed by themselves. The Finnish collaboration model is a solution to this problem. In Finland, several public organizations have joined forces to create a collaborative program (called Kallio, see Figure 11 below) where the data needs of various user ecosystems are met. Costs are covered together, which makes it possible to acquire enough up-to-date data for all user needs. The data is also provided as open data for the whole society, which boosts innovation. Large procurements make the market attractive for private companies as well. The Finnish collaboration model not only provides data for sustainable future, but it is also a sustainable collaboration model as data acquisition is planned on a long-term perspective.

<sup>13</sup> See presentation: [https://eurogeographics.org/app/uploads/2023/11/8.-EuroSDR\\_Collaboration\\_20240208-09.pdf](https://eurogeographics.org/app/uploads/2023/11/8.-EuroSDR_Collaboration_20240208-09.pdf)



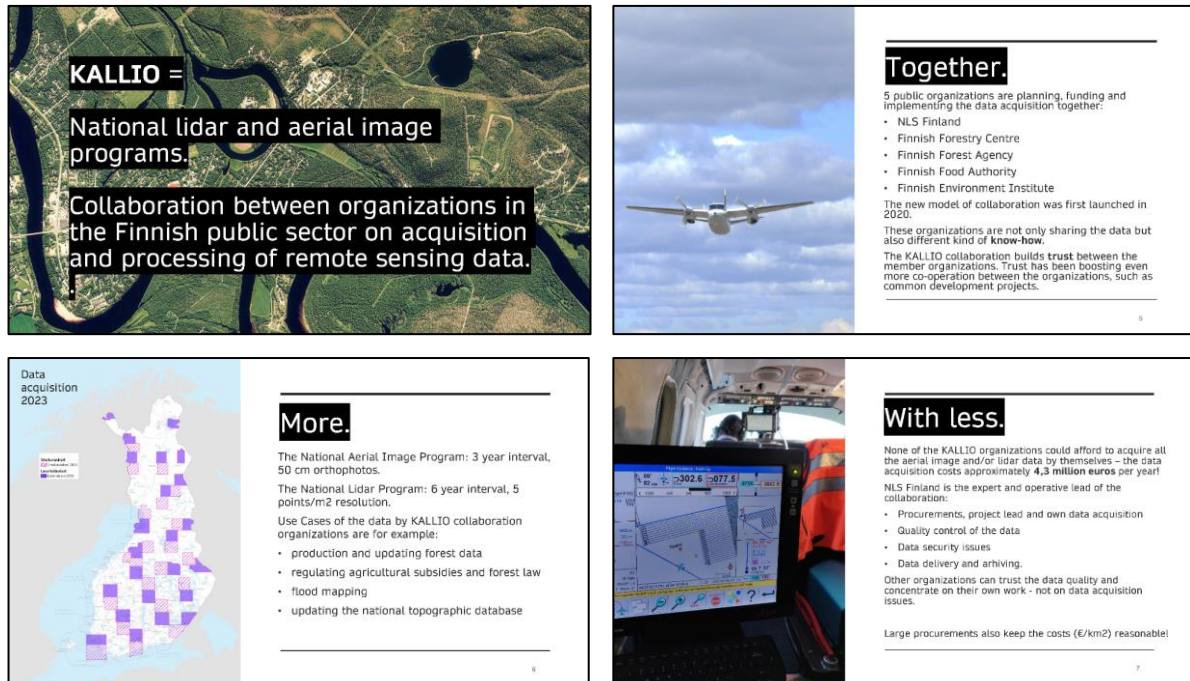



Figure 11: Kallio programs in Finland

Over the years the collaboration has provided essential data for evidence-based decision making in a cost-effective manner. Currently yet another round of collaborative data collection with enhanced specifications is being planned to support the implementation of Digital Twin Finland (see Figure 12 below).

The first KALLIO program will end 2025 with whole of Finland lidar coverage in 5 points/m2 (and 50cm aerial twice).

**A new KALLIO program is under planning to be launched starting 2026.**



The goal is to expand the KALLIO collaboration to involve more organizations and to collect more detailed data.

Planned datasets include point density of 20 points/m2 (laser scanning) and aerial images with resolution of 20 centimeters.

With detailed datasets and information there are more use cases, such as:

- Digital Twin of Forests
- Carbon sink & other Green Deal analysis
- Digital Twins / Smart cities/municipalities
- Digital Twin of Freshwater network
- Digital Twin of Traffic infrastructure
- Metaverse applications
- Other Data ecosystems and Data Spaces??

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Figure 12: the next Kallio program in Finland

### 3 Panel Session

The panel session, facilitated by Joep Crompvoets, has included all the participants of the workshop in a very living discussion.

In introduction, the attendees of the panel discussion underlined two points:

- National Mapping, Cadastral and land registration agencies (NMCAs) have not only to make your data accessible, but they have to make their data usable! The reason of being of a NMCA is not mapping anymore. It is to be useful to society or to public authorities (some nuances of opinion among the participants).
- The Geospatial European policy does not really have a home! Data policy is very fragmented. That could be confusing for NMCAs to know where to target (this point was emphasized by Alexander Kotsev from the Joint Research Centre (JRC), the European Commission's science and knowledge service, in the keynote presentation<sup>14</sup> he did during the workshop on *Data Ecosystems and Spatial data infrastructure – facilitators for data value creation*, slide 14).

Several questions were asked to workshop attendees. For each question a round table was done to collect answers and opinions.

**Question 1- *The “High Value Dataset” commission implementing regulation will apply (on its economics side) within four months for EU27. For those within the EU, did you ask your government for an exemption? If yes, granted? If yes, could you share the main arguments of your request?***

Two countries (Belgium and Sweden) indicated that they have asked for an exemption. *“The exemption was pushed, but hasn’t been published”*; *“Yes, we have asked for it. We hope that we will have the money within February 2025. We have a lot of issues with geospatial open data”*. The main argument was in favour of maintaining essential revenue flows to balance yearly budget balance to fund all costs; it being understood furthermore that the additional costs generated by the transition to open data are still not financed.

Two countries (Finland and France) answered that no exemption was asked. *“No need for it, as we are publishing already our high-value datasets in open data.”* For The Netherlands, no exemption seems to have been asked for too.

A discussion began between the participants to find out how to finance the dissemination of historical data, which seem to be also affected by the regulations.

For specific grants, it went in different ways.

In France, a specific starting 3 M€ grant was got in 2011, 2012 and 2013 (when high scale databases switched from fees model to open data model for public authorities' uses) and another 0,8 M€ starting one in 2017 (when the French Open data law, also known as “Loi pour une République numérique”, untried into force).

In Finland, the loss of revenues was assessed to 500 k€ per year when the geospatial data were opened (a process that started in 2012). The National Land Survey of Finland did not get specific extra fundings for that but the costs have increased a lot since because data are more and more used.

In Sweden, Lantmäteriet got a specific grant of 5 M€ to fund open data. But there is an additional yearly need from 15 to 16 M€ that is not covered yet.

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<sup>14</sup> See presentation *Beyond SDI – Evolution towards the Common European Green Deal Data Space* <http://www.eurosdri.net/workshops/workshop-data-ecosystems-and-spatial-data-infrastructure>

A very thorough study was led by NGI Belgium (with a review of 52 datasets): its conclusion was a 3 M€/year extra funding need to comply with High Value Datasets (HVD) regulation. As nobody wanted to fund, the hypothesis to downsize the datasets' update frequency (from 5 years cycle to 10 years cycle) was done. Even if for the income, it's a little bit easier to say who should pay, for the extra-cost nobody wants to fund open data.

The Kadaster (The Netherlands) does not expect to lose income with the HVD regulations. But a 1.5 M€ budget is needed to comply with the Open Data Directive's implementation act and another 10 to 15 M€ one to secure the infrastructure (the open data dissemination is on premise). The issue is that, without specific grant, all the money goes to this but not in the core assignment of the agency.

**Question 2 - Do you have to alter activities and/or to adapt the way you operate them (IA processes, external partnerships with new actors...)? Do you have to stop activities and/or to start new ones?**

In Sweden, a collaboration with the private sector is settled since several years. Private companies can get Lantmäteriet data for free but if they resell them, they have to pay a fee to the agency. This partnership will not work anymore with HVD regulation. So, a "plan B" has to be found.

The Kadaster (The Netherlands) does not have to stop any activities. But some adaptations are required. For instance, the Dutch geoportal will have to switch from on premise to public cloud solution (cheaper).

In Belgium the work in the NGI's sales office would change (other types of partnerships that will have to be done). NGI wrote a very detailed road map about everything that will have to be adapted. Paper maps for tourists could be a product "left" to the private sector (but it is not certain that it will go to this market, maybe not sufficiently profitable).

In France, the IGN's geo-commons strategy (see presentation by Clément Godin<sup>15</sup>) led to build partnerships with public authorities, private companies (included start-ups and SMEs) and citizens (Panoramax project<sup>16</sup>, "*the free alternative to photo-mapping territories*", is a good illustration of it). The internal processes are becoming more and more automated (with AI) and open challenges are launched to enhance automatic processes<sup>17</sup>.

Up to now, nothing has to be abandoned or adapted in National Land Survey of Finland in its processes or products and services.

**Question 3 - If you have moved to a different business model, especially the implementation of open data rather than fee generating data, what unexpected benefits have there been? For example, more engagement with citizen, SMEs etc. How has this impacted on the business model, if at all? Has it had to be modified as you have become more mature in your open data delivery?**

NGI Belgium has not moved yet to another Business Model. The agency has become more mature in the open data delivery. "*The Return On Investment (ROI) argument could have helped* [N.A: it was the

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<sup>15</sup> [https://eurogeographics.org/app/uploads/2023/11/3.-20240208\\_EG-EuroSDR\\_Sustainable-Business-Models-for-NMCAs\\_IGN-FR.pdf](https://eurogeographics.org/app/uploads/2023/11/3.-20240208_EG-EuroSDR_Sustainable-Business-Models-for-NMCAs_IGN-FR.pdf)

<sup>16</sup> See <https://panoramax.fr>

<sup>17</sup> See FLAIR, the Artificial Intelligence challenges organised around geo-data and deep learning: <https://ignf.github.io/FLAIR/>

promise of several open data report submitted to the European Commission<sup>18]</sup> *but this is not working for the moment.*”

In The Netherlands, the Kadaster got definitely more engagement with citizens. Moreover, some products are very valued: “Topotijdreis” website (data in the past with topomaps time travel) is a huge hit. *“Open data helps, if you have the right product and if it is for free.”*

The National Land Survey of Finland got better quality thanks to the feedbacks (citizens or private fellows). *“We could see the exponential rise of these feedbacks. And the rise of the use of the data which generates... the rise of the costs”.*

For IGN France the Open data switch enhanced a lot of trust and image building to set up partnerships with public organisations. But the sustainability of disseminating core open data on one hand and developing pre-funded major projects to support public policies on the other hand Business Models still needs to prove itself in the long term. A general advisory mission led in France in 2024 could get some clarity about it.

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<sup>18</sup> See for instance *Creating Value through Open Data - Study on the Impact of Re-use of Public Data Resources* (2015) - Publications office of the European Union, page 48 : « (...) *This would mean a seven-fold Return on Investment (ROI), while the US has a 39 fold ROI (...). It demonstrates that an investment in Open Data is always recovered maifold.* » <http://www.europeandataportal.eu/en/content/creating-value-through-open-data>



## 4 Conclusion

The High Value Datasets regulation is finally more challenging than estimated two years ago during the previous online workshop on Sustainable Open Data for National Mapping and Cadastral Agencies (NMCAs). One most quoted participants' takeaway is: *"I have learned that the Open Data directive HVD implement act is not so simple than the European Commission said. There is a real big shift between all NMCAs willing to share their data but they all need money to do so. It definitely has a cost!"*

All NMCAs are willing to open and share their data but there are some issues to solve, even if the situation can be different from one country to another, and *"money is the biggest"* (funding).

Participants agreed on *"If you make the rule the problem is solved"* European Commission's motto is not always working. And EC's regulation is becoming more and more complex (with a lot of piled texts such as Data Governance Act, Data Act, IA Act, next review of INSPIRE Directive etc.) to follow and understand.

But on the positive side, many observations were shared:

- INSPIRE Directive was a good leverage in many cases: for the NGI Belgium's "data broker" strategic position; for the launch of Dutch geoportal portal (PDOK); etc.
- Rise of awareness, good practices and issues sharing are very valuable, as the direct expression of the collective intelligence of networking: *"I'm backing home with some good arguments and insights."*; *"I have understood during these two days that I am not alone"*.
- The Business Models issue is fostering digital transformation and allowing to be more efficient.

At last, all participants agreed on the very crucial period that comes with the very last deadline of February 2025 to comply for EU27 members with High Value Datasets regulation and on the necessity to take another look at the situation in two years (early 2026) with a repetition of this workshop.

## **Appendix: Participating organisations**

The Workshop on Sustainable Business Models for NMCAs, Leuven 8th and 9th of February 2024, was attended by participants from the following organisations:

Agency for Data Supply and Infrastructure (SDFI, Denmark)

EuroGeographics

EuroSDR

Hellenic Cadastre (Greece)

IGN Belgium (Belgium)

IGN France (France)

Kadaster (The Netherlands)

KU Leuven (Belgium)

Lantmäteriet (Sweden)

National Land Survey (Finland)

TU Delft (The Netherlands)

University College London (Great-Britain)

## Appendix: Workshop programme

Time	Author	Title
Day1		
10:00	Sallie Payne Snell & Joep Crompvoets	Opening
10:15	Joep Crompvoets	Keynote Business Models
11:00	Frédéric Cantat	Recap from previous Workshops
11:30	Hara Papadaki	Investigating the benefits of a pan-European cadastral data strategy
13:20	Lea Schick	Data Spaces – EU’s visions for alternative data exchange infrastructures
12:00	Lunch break	
13:30	Bert Beentjes & Richard Witmer	Sustainable business models for geospatial data under financial stress
14:00	Clément Godin	From gran-aided geodata producer to major contributor to geocommons
14:30	Peter Knudsen	Basic Data Ecoystem in Denmark
15:00	Coffee break	
15:30	All attendees	Panel discussion
17:00	End of day 1	
19:00	Dinner	
Day2		
09:25	Joep Crompvoets	Welcome day 2
09:30	Frédéric Cantat	Keynote: a journey to the roots of Openness culture
10:00	Jani Kylmäaho	Collaborative data collection enabling evidence-based decision making and innovation
10:30	Ingrid Vanden Berghe	The paradigm shift of open data and the challenge of sustainable funding for open data producers
11:00	Coffee break	
11:30	All attendees	Panel Discussion
12:30	Joep Crompvoets & Frédéric Cantat	Conclusion and close