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Workshop on Sustainable Business Models
for National Mapping and Cadastral Agencies
(2026)

Joint workshop of
EuroGeographics and EuroSDR
February 9th-10th 2026 – NGI, Belgium

Frédéric Cantat, Joep Crompvoets,
Oliwia Marszalek, Jack Metcalfe

Official Workshop Report

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“Workshop on Sustainable Business Models for National Mapping and Cadastral Agencies (2026)”

Joint workshop of EuroGeographics and EuroSDR

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Table of contents

Index of Figures	6
Index of Tables	6
Abstract	7
Acknowledgement	7
1 Introduction	8
2 Presentations	9
2.1 Keynotes	9
2.2 Recap from previous workshops	15
2.3 Thematic contributions on new challenges	15
2.4 Feedback’s presentations from NMCAs	19
3 Conclusion	33
References	37
Appendix A: Participating organisation	38
Appendix B: Workshop programme	39

WORKSHOP ON
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NATIONAL MAPPING AND CADASTRAL AGENCIES
(2026)

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Index of Figures

Figure 1: General impact of the Digital Omnibus Regulation proposal on existing documents	11
Figure 2: Impact of the Digital Omnibus Regulation proposal on existing documents – Focus on data rulebook.....	12
Figure 3: Challenges that NMCAs are facing according Jordi Escriu	14
Figure 4: Identified patterns of organisational and business-model variation among the 15 surveyed NMCAs	16
Figure 5: Unique users' evolution of EuroSDR datasets from 2023 to 2025	18
Figure 6: 2025 NGI Belgium budget	19
Figure 7: Provision status of the 16 Lantmäteriet High-value datasets	22
Figure 8: Data combination and data federation, potentially transformative dimension for NMCA business models.....	23
Figure 9: How to find adequate NMCA Business model when you add data combination and data federation models in the existing landscape?	24
Figure 10: Two large areas affected by GNSS jamming on the Eastern side of Finland	26
Figure 11: National Agency of Public Registry of Georgia's digital transformation journey	28
Figure 12: An offer structured in 6 bricks and 4 claims to move forward.....	31

Index of Tables

Table 1: Comparative table of responses given in 2024 and 2026 by workshop participants.....	10
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Abstract

Two years after the previous Business Models Workshop (February 2024, Leuven, Belgium), National Mapping and Cadastral Agencies (NMCAs) reconvened to evaluate the impact of the European regulation on High-Value Datasets (HVD), which had been identified at the time as a potential game changer for their business models. Since February 2025, the regulation has been fully applicable, requiring all EU NMCAs to make designated geospatial datasets available free of charge and with minimal technical and legal restrictions.

This time, the workshop took place in Brussels, bringing together representatives from NMCAs, researchers, and policymakers to assess the practical consequences of this major regulatory shift and exchange experiences of adaptation. Presentations from agencies across Europe and beyond illustrated a diverse landscape of business models, reflecting different levels of preparedness and a range of strategies for ensuring long-term sustainability.

While the implementation of the HVD regulation remained the central focus, discussions also explored broader strategic challenges and opportunities, including Digital Twins, data federation, the integration of artificial intelligence, and digital sovereignty. Participants agreed that, although the transition to open geospatial data enjoys strong political support, it continues to present significant financial and operational challenges, demanding sustained innovation, collaboration, and policy commitment.

The opening keynote featured a live survey that revealed a markedly more optimistic outlook than at the Leuven workshop two years earlier. Nevertheless, the closing presentation by IGN France captured the enduring challenge facing many agencies: despite significant progress and successful adaptation, many NMCAs are “still looking for a sustainable business model”.

Acknowledgement

The workshop was hosted by NGI Belgium (National Geographic Institute) at their Brussels headquarters, with the support of EuroSDR's secretariat and EuroGeographics.

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

Matina Fuentes, Knowledge Exchange Manager, EuroGeographics
Oliwia Marszalek, Membership and Data Officer, EuroGeographics
Patricia Sokacova, Membership and Communication Manager, 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 4 on Business Models and Operations

The workshop was carried out with contributions from further EuroSDR representatives:

Claire Ellul, University College London,
Chair of EuroSDR's Commission 3 on Information Usage and Visualization
Eric Bayers, National Geographic Institute (NGI) of Belgium,
EuroSDR Prime delegate Belgium

1 Introduction

The previous edition of the workshop organised in 2024 in Leuven had concluded with a prescient observation. All participants agreed at that time on the crucial period ahead, with the February 2025 deadline for EU Member States to comply with the High-value datasets regulation representing a defining moment. The workshop report had emphasized the necessity of reconvening in early 2026 to assess the post-implementation reality¹.

When participants gathered at NGI Belgium headquarters in Brussels on February 9-10, 2026, Commission Implementing Regulation (EU) 2023/138 of 21 December 2022² *laying down a list of specific high-value datasets and the arrangements for their publication and re-use*, had fully entry in force. For the first time, EU NMCAs were operating under a comprehensive mandate to provide some designated geospatial datasets as open data, free of charge, with minimal restrictions. The previous discussions of 2024 had given way to operational realities, budget negotiations, technical implementations, and organizational adaptations.

The 2026 workshop objectives had therefore evolved significantly from those of its predecessor. Rather than anticipating future challenges, participants sought to assess what had transpired following HVD compliance. Had agencies secured the necessary funding? How had operations adapted? What unexpected challenges had emerged? The focus shifted from theoretical frameworks to concrete experience sharing, with agencies presenting practical solutions deployed, lessons learned from both successes and failures, and honest assessments of remaining gaps.

Beyond the immediate HVD implementation assessment, the workshop explored also emerging challenges appearing on the horizon now that the basic regulatory compliance hurdle had been cleared. New strategic dimensions had intensified since 2024, including the role of NMCAs in Digital Twin infrastructures, opportunities and risks associated with data federation, practical applications of Artificial Intelligence in production workflows, and growing concerns about digital sovereignty in an increasingly geopolitical data landscape.

Over two intensive days, participants engaged in keynote presentations setting strategic and policy context, detailed case studies from agencies at different stages of adaptation, and roundtable discussions aimed at collectively interpreting the complex and heterogeneous picture emerging from individual experiences. The workshop revealed that while all NMCAs faced common pressures from open data mandates, digital transformation requirements, and resource constraints, their responses and outcomes varied based on institutional context, funding mechanisms, governance structures, and strategic choices. Some had achieved relative stability through collaboration models, strategic partnerships, or secured public funding. Others continued to struggle “day by day” despite political support and technical excellence, exposing fundamental questions about the sustainability of NMCAs' missions under current European data policy frameworks.

The workshop thus served not only as an inventory exercise but as a collective reflection on whether the business models emerging post-HVD were truly sustainable or merely interim adaptations masking deeper structural challenges requiring more fundamental policy responses at national and European levels.

¹ See workshop report: <https://www.eurosdrr.net/publications/workshop-report-sustainable-business-models-national-mapping-and-cadastral-agencies>

² See Regulation text: http://data.europa.eu/eli/reg_impl/2023/138/oj

2 Presentations

The presentations were organized in three main blocks: keynotes setting strategic and policy context, emerging thematic contributions on new challenges like Digital Twins and open data licensing, and feedback presentations from NMCAs sharing their concrete post-HVD experiences and business model adaptations.

2.1 Keynotes

Joep Cromptvoets, Professor Information Management in the Public Sector, KU Leuven, and Vice-President of EuroSDR, presented³ “Business Models at National Mapping and Cadastral Agencies – An introduction”. He opened the workshop by revisiting the business models conceptual framework that had structured the 2024 Leuven discussions. He reminded participants that a business model fundamentally describes the rationale of how an organization creates, delivers, and captures value. The framework encompasses four interconnected domains: service offerings and value propositions, financial arrangements including revenue streams and cost structures, organizational dimensions such as governance and partnerships, and technological infrastructure and capabilities.

Joep Cromptvoets emphasized the importance of viewing sustainability through a triple bottom line approach rather than purely financial terms. Economic sustainability meant achieving financial viability without over-reliance on subsidies, ensuring that core operations could be maintained through a balanced mix of funding sources. Environmental sustainability involved reducing organizational footprints while simultaneously enabling better environmental decision-making through the data and services provided. Social sustainability encompassed ensuring equitable access to geospatial information, promoting inclusion, and demonstrably supporting public value creation across diverse user communities.

Building on the 2024 workshop discussions, Joep Cromptvoets presented several propositions to the participants, inviting reflection on how perceptions and realities had evolved over the past two years. These included assessing the current performance of NMCA business models, identifying the main requirements for implementing strong and sustainable approaches, determining who the primary beneficiaries of robust NMCA business models should be, and recognizing the principal bottlenecks hindering implementation. He also prompted discussion on which types of business models currently dominated among NMCAs and which might emerge as more prevalent in the future, as well as whether participants felt their business models were fundamentally at risk.

The first proposition submitted to the participants revealed **a much more optimistic atmosphere than two years before** (see Table 1 below) with a switch of the auto-assessment of the performance of their NMCA business model from “*Strong in the past moderate or weak for the future*” to “*strong [majority] or moderate*”. The proposition about the main Business Model currently applied at NMCA’s reveals **a very strong rise of the open-source model**, the most quoted answer principally, just before State budget funding. It is worth noting that all the proposals are quoted (except the advertising model) demonstrating a wide variety of situations or solutions tested.

³ See presentation:

https://www.eurosdrr.net/sites/default/files/images/inline/1_20260209_sustainable_business_models_cromptvoets.pdf

Proposition submitted	Answers given in 2024	Answers given in 2026 (nb)
<i>The performance of your NMCA business model is very strong/ strong/ moderate/ weak/ very weak</i>	<i>Strong in the past moderate or weak for the future the most quoted answer</i>	<i>Strong (4) Moderate (2)</i>
<i>In order to implement strong business models at NMCA's, there is a strong need for Clear rules and working structures/ Competition and market/ Profound cooperation</i>	<i>Clear rules and working structures and Profound cooperation equally quoted</i>	<i>Clear rules and working structures (5) Profound cooperation (4)</i>
<i>The main beneficiary of a strong NMCA-Business Model is: NMCA itself/ Public sector/ Private sector/ Citizens/ Society</i>	<i>Public sector and Society equally quoted</i>	<i>Public sector (4) Society (3) NMCA itself (1)</i>
<i>The second important beneficiary of a strong NMCA Business Model is: Public sector/ Private sector/ Academia/ NGO/ Citizens/ Society</i>	<i>/</i>	<i>Public sector and Society equally quoted</i>
<i>The main bottleneck for implementing a strong Business Model at NMCA is: Political/ Financial/ Legal/ Cultural/ Technological/ Human competences</i>	<i>Balanced Political, Financial, Legal</i>	<i>Legal (4) Financial (3) Political (1) Technological (1) Human competences (1)</i>
<i>The main Business Model currently applied at NMCA's is: Freemium/ Licensing/ Open source/ Platform/ Subscription/ Advertising/ Ecosystem services/ Product selling/ State budget</i>	<i>State budget combined with Freemium, Open-source, Product selling</i>	<i>Open source (8) State budget (7) Product selling (6) Freemium (5) Licensing (5) Platform (5) Ecosystems services (4) Subscription (1)</i>

Table 1: Comparative table of responses given in 2024 and 2026 by workshop participants

The subsequent presentations would provide concrete answers from different national contexts.

Marjana Zelic, Senior Research and Policy Officer at EuroGeographics, proposed to the attendees an update on the European Commission (EC) Policy with a focus on its Digital Omnibus Proposal and its Data Union Strategy⁴.

Marjana Zelic began her presentation by situating the two initiatives within the broader political context of the von der Leyen Commission's second term spanning 2024 to 2029, emphasizing simplification as a key priority⁵. This reflected growing recognition within EU institutions that the proliferation of digital regulations had created complexity burdens for public and private sector organizations alike. 5 billion euros in administrative cost saving are expected for businesses within 2029.

At the end of 2025, the EC released its Digital Omnibus Simplification Package. Marjana Zelic explained that *"Omnibus" means comprising several items. An omnibus bill is a type of legislation that combines multiple issues into a single document. This approach allows lawmakers to address diverse subjects at once rather than introducing separate bills for each topic. It is a single document that is accepted in a single vote.*" This package included notably the Digital Omnibus Regulation, a separate simplification proposal on Artificial Intelligence, the Data Union Strategy, a policy roadmap on data and AI, and an Environmental simplification package that included a proposal for INSPIRE simplification.

The aim of the Digital Omnibus Regulation Proposal is to consolidate four data-related documents (Data Act, Data Governance Act, Free-Flow of Non-Personal Data Regulation and Data Act) into one (Data Act) (see Figure 1 and Figure 2 below).

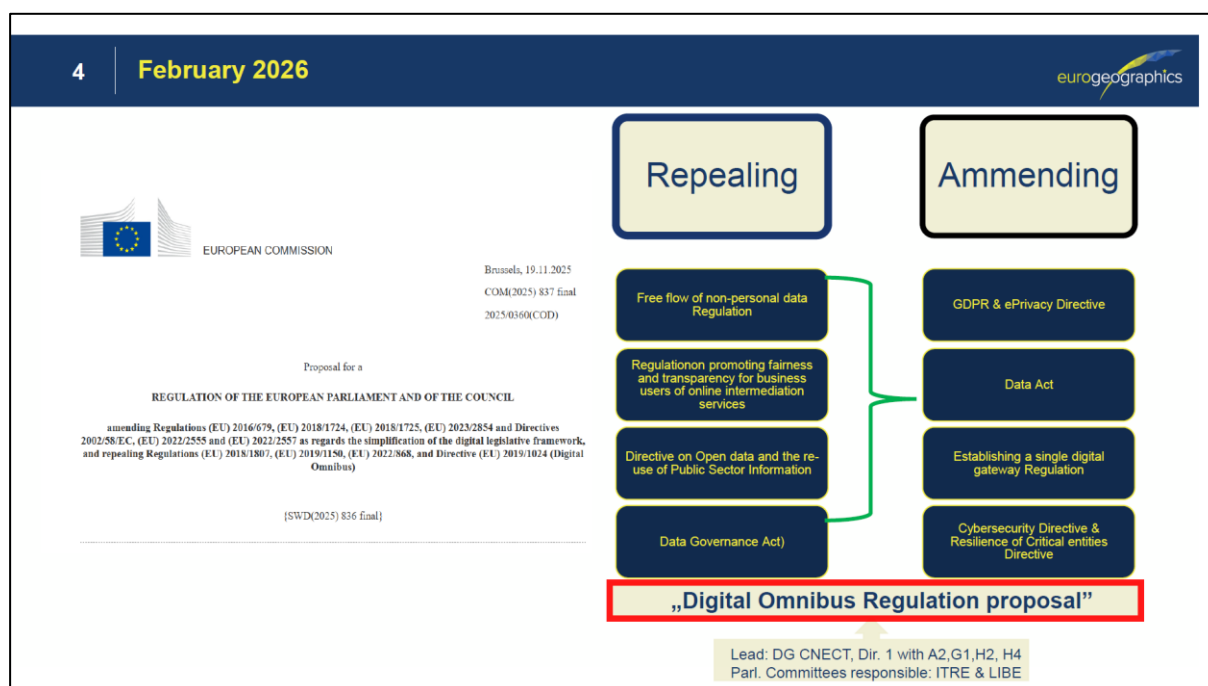


Figure 1: General impact of the Digital Omnibus Regulation proposal on existing documents

⁴ See presentation:

https://www.eurosd.net/sites/default/files/images/inline/3_20260209_eurosd_egworkshop_zelic.pdf

⁵ See *A simpler and faster Europe: Communication on implementation and simplification*, European Commission, November 2025 <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52025DC0047>

Digital Omnibus Regulation Proposal

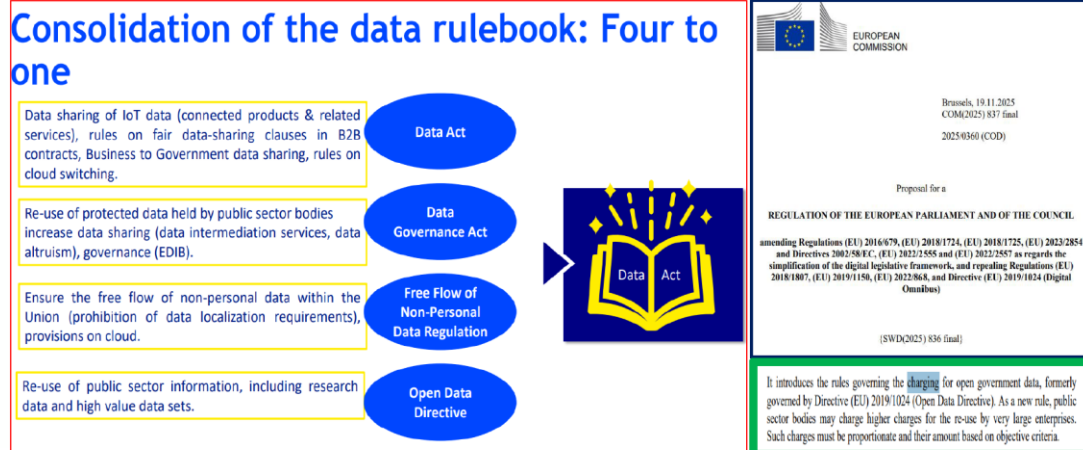


Figure 2: Impact of the Digital Omnibus Regulation proposal on existing documents – Focus on data rulebook

The second and last focus was done on another communication by EC in November 2025: Data Union Strategy⁶. The strategy explicitly framed “*data as a core strategic resource and invest in secure, high-quality, and interoperable datasets that reflect European values and standards. Strengthening Europe’s ability to collect, curate, and use its own data is both an economic and security imperative*”. This elevated data from merely an administrative asset to infrastructure of strategic importance.

The strategy comprised three pillars converging on data availability as the foundational requirement. The first pillar focused on scaling up access to data for AI applications through initiatives such as data labs offering trusted pseudonymisation services and pooling data resources across public and private actors to provide companies and researchers with high-quality datasets. The second pillar addressed streamlining data rules to make sharing easier for businesses and researchers, including reforms to reduce consent fatigue while protecting fundamental rights. The third pillar aimed to strengthen the EU’s global position on international data flows by tackling unjustified trade barriers to ensure European entities could compete globally on a level playing field.

⁶ See document *Data Union Strategy – unlocking data for AI*, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2025%3A835%3AFIN>

Jordi Escriu is Scientific Project Officer at Digital and Data Sovereignty Unit (JRC T.4) of European Commission Joint Research Centre (JRC). He opened his presentation⁷ by outlining how geospatial data fit within the European Commission's political priorities for the 2024-2029 mandate. Three areas emerged as particularly strategic for NMCAs. First, in building a prosperous and competitive Europe, geospatial data served as foundational infrastructure for leveraging advanced technologies including artificial intelligence, quantum computing, semiconductors, and space technologies. Second, supporting the green transition required authoritative geospatial information as essential input for environmental decision-making, climate adaptation, and monitoring progress toward sustainability goals. Third, in the security and defence domain, ensuring territorial data sovereignty had become critical, positioning NMCAs as custodians of strategic national assets.

In the second part of his presentation, Jordi Escriu provided detailed analysis of INSPIRE Directive's evolution from version 1.0 to the emerging 2.0 framework aligned with the Green Deal Data Space. He acknowledged INSPIRE 1.0's achievements in establishing data availability across the EU, building an active community, creating an ecosystem of open-source tools, and enabling interoperability through prescribed standards. However, limitations had become apparent: the framework was rigid in both legal and technical terms, governance remained data provider-centric, licenses were often missing or unclear, and prescribed standards and technologies were not always widely adopted.

The INSPIRE 2.0 direction, part of the Environmental simplification package, aimed to address these limitations through significant reforms. The proposal aligned INSPIRE with the Open Data Directive, removed rigid interoperability and network service requirements, eliminated the obligation for the Commission to operate a dedicated EU Geoportal in favour of integrating with the European Data Portal at data.europa.eu, and replaced Member State monitoring and reporting obligations with mechanisms under the Open Data Directive and HVD reporting. What remained regulated included coordination mechanisms, metadata requirements, and the thematic data coverage in Annexes I, II, and III, though without references to detailed harmonisation rules. The shift was from prescription-based to incentive-based interoperability, from rigid to flexible frameworks, and toward approaches that were use-case driven based on real needs.

In a third part, Jordi Escriu introduced the concept of AI-ready data, defining it through several characteristics: comprehensive documentation of datasets, clear structure and semantics enabling machine processing, documented provenance and quality information, compliance with relevant standards, capabilities for quality evaluation, and demonstrated interoperability. This represented a higher bar than simply making data available or even making it open; AI-readiness required additional investment in metadata, documentation, and technical infrastructure.

In the fourth part of his presentation titled *A changing landscape, a personal reflection on NMCAs in the EU data landscape*, Jordi Escriu shared with the audience frank personal assessment of the profound adaptation expected of NMCAs. According to him, NMCAs challenges would consist in finding, new ways of adapting their ecosystem while doing their work better, and the right balance between staying focus on quick-wins and avoiding getting lost in complexity (see Figure 3 below).

⁷ See presentation

https://www.eurosdrr.net/sites/default/files/images/inline/4. 20260209_vision_eu_data_landscape-jrc-jescriu.pdf



Figure 3: Challenges that NMCAs are facing according Jordi Escriu

Jordi Escriu concluded his presentation by sharing the main topic the JRC T.4 unit was currently working on. Digital and data sovereignty, defined it not as isolation or protectionism but as the EU's capacity to exercise technological autonomy and make independent choices, were an emerging priority. He showcased also the JRC's Data Sharing (+Sovereignty) Innovation Lab (DSI Lab) as a resource offering European cloud instances, technical components, and methodologies for NMCAs to explore innovative approaches while maintaining sovereignty. In his final word, he invited the audience to explore some relevant activities and documents for NMCAs ran and published by JRC T.4:

- *JRC FAIR data sharing guidelines* (Lowenthal et al. 2025)
- *ISO & GeoDCAT-AP metadata implementation Pilot* (Escriu et al., 2025)
- *Interoperability approaches for environmental data sharing and reuse in the European Union* (Reitz et al., 2025)
- *AI Generated Synthetic Data in Policy Applications* (Hradec et al., 2024)

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 four 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)
- Sustainable Business Models for NMCAs – 8-9 February 2024 (Leuven, Belgium)

The context, the highlights of the agenda and the main takeouts were shared⁸ with the participants.

2.3 Thematic contributions on new challenges

Jack Metcalfe, a Doctoral Student at University College London part-funded by EuroSDR, reported⁹ interim PhD findings on why NMCA business model heterogeneity is a critical (and often overlooked) pre-condition for understanding what Digital Twins (DT) mean for NMCAs, and summarised early evidence from a EuroSDR questionnaire and a complementary conceptual value analysis.

The presentation defined DTs through the essential characteristics of: data integration, bidirectionality (including human-in-the-loop), temporality (i.e. variable update frequencies) and, the fact that they are, outside of manufacturing environments, geospatially-enabled. Though the geospatial component of DTs is noted as often being implicit (i.e. not stated or recognised), raising questions about attributing value of NMCA contributions to DTs (Metcalfe et al., 2024).

The presentation started by providing context and motivation for this piece of research, citing how policy and research discussions often treat NMCAs as a broadly homogenous organisational category, despite limited empirical evidence that they operate with comparable mandates, capacities, constraints, and business models. This matters for DT programmes because conceptual expectations about NMCA roles can implicitly assume similar organisational capability across countries, even though earlier pan-European experiences show that “one-size-fits-all” assumptions can encounter uneven organisational realities (de Vries et al., 2011) and that automation/production modernisation has historically exposed different maturities and constraints (Stoter et al., 2016). The presentation also situated these issues within wider pressures on NMCAs, including “open by default” policy directions leading to revenue pressure, changing markets and alternative geospatial data providers, and technology shifts (including AI and DTs) that alter customer expectations towards increased representational richness and temporal currency.

A structured questionnaire was distributed to 20 EuroSDR member NMCAs, with 15 responses analysed using qualitative and quantitative assessment to identify patterns of organisational and business-model variation (See Figure 4 below). The question topics related to business models, ways of working, country contexts and current engagements with DTs.

Responses indicated substantial variation across ten defining characteristics: organisational scale, operational autonomy, public funding reliance, country-specific geospatial data production ecosystem, strategic mission, portfolio breadth, partner ecosystem, innovation maturity, and R&D profile.

⁸ See presentation:

https://www.eurosdrr.net/sites/default/files/images/inline/2.20260209_recap_from_previous_workshops_cantat.pdf

⁹ See presentation: https://www.eurosdrr.net/sites/default/files/images/inline/5.20260209_presentation-dt-business-models_metcalfe.pdf

Heterogeneity was greatest for revenue structure (20–100% public funding), organisational size (staff ratios normalised by national area spanning two orders of magnitude), and operational autonomy (from considerable government influence to strategic independence). The presentation further illustrated clustering into multiple groupings (plus outliers), underscoring that comparable DT expectations will translate into different organisational change pathways depending on funding mix, autonomy, and R&D capacity. On DT engagement specifically, NMCAs reported contributing more than data—most notably expertise/advice (n=6) compared with 3D data provision (n=5), alongside quality assurance and convening roles—supporting a multi-dimensional view of NMCA participation in DT initiatives.

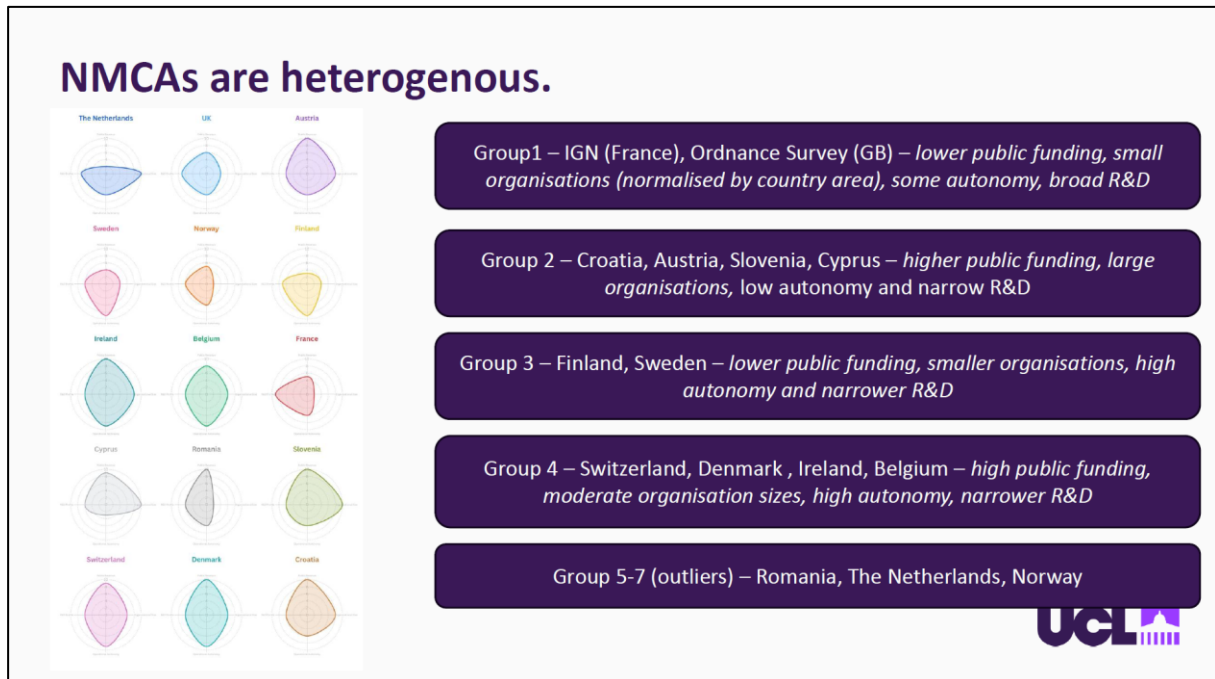


Figure 4: Identified patterns of organisational and business-model variation among the 15 surveyed NMCAs

A central implication is that DT guidance for NMCAs cannot be generic: differences in revenue constraints, cost pressures, customer channels, partnership reliance, and portfolio breadth shape what “good” looks like in practice and what can realistically be operationalised for different NMCAs. Barriers to DT engagement were reported as primarily resource-related (lack of funding (n=8); insufficient technical resources: (n=7)), while comparatively fewer respondents selected “value of DTs to the NMCA not clearly articulated” (n=3) or “unclear NMCA role in DTs” (n=3), suggesting a gap between perceived importance of DTs to NMCAs and fundable business-case articulation. The presentation argued that this gap is partly explained by the infrastructure-like character of foundational geospatial data, of which NMCAs provide to DTs. Existing product-oriented value tools (such as that of Osterwalder and Pigneur, 2010) can help describe NMCA value attributes but tend to under-specify systemic, non-rival, and spillover value mechanisms typical of foundational geospatial data.

To address this, the session outlined value types relevant to NMCA data in DTs (economic, functional, societal, environmental, knowledge-based) and proposed additional value mechanisms which must be assessed in DT contexts such as foundational infrastructure effects, public-good/ network effects, interoperability/standards benefits, quality and assurance, historical/option value, cross-domain integration, and spillovers benefits, each of which complicates attribution of NMCA value in DTs.

The workshop was invited to discuss practical experience with DT-related business cases (what enabled investment, what blocked it), and whether business-model adaptation is needed to sustain NMCA “foundational infrastructure” roles as DT ambitions expand. The work is continuing to evolve with suggestions from the workshop regarding: including product/service types as part of the typology and supporting the questionnaire results with evidence from NMCA annual reports. A discussion then followed about the law (in respective countries) needing to be more explicit about the role of the NMCA and the implications of NMCA heterogeneity on initiatives like INSPIRE and those being developed by EuroGeographics.

Oliwia Marszalek, Membership and Data Officer at EuroGeographics (EG), presented¹⁰ in the introduction of her presentation the three fundamental pillars of EG activity: knowledge exchange, by maintaining a knowledge exchange network to support its members in improving their capabilities and role, representation, by representing its members interests, and data activity, by facilitating access to its members’ data and demonstrating its importance.

She explained that a strategic focus is on positioning EG as an enabler that allows users and key stakeholders easy access to members data, which is done, through various activities, including working with the European Environment Agency (EEA) and the Copernicus Insitu component enabling access to national data for the Copernicus services, and through various contracts, or directly through a contract with Eurostat for the provision of administrative unit dataset for the use within all of the European Commission and it’s agencies (using authoritative data especially for boundaries is a point of focus the Commission). EuroGeographics also fulfils this strategic aim through the production and distribution of pan European datasets.

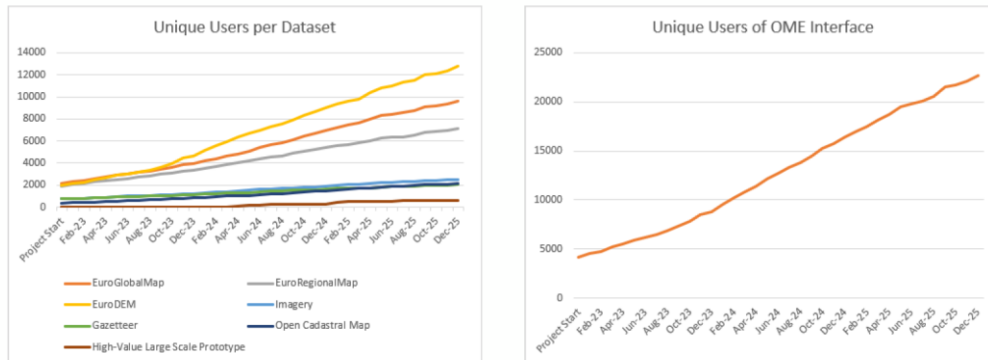
Open Maps for Europe 2 (OME2) Project is a good example of such pan European datasets. EG delivered in 2025 a product composed of some EG members’ authoritative data which is aligned to EU Policy objectives and United Nation core geospatial data recommendations, and which is foundation for future pan-European High-value datasets. One of OME2 outputs is the OpenCadastral Map (OCM), which is composed now of 15 countries which provide administrative units, cadastral parcels, building and addresses. The OCM is open data, and national data can be downloaded directly through links to data providers on the portal. The cadastral work package also delivered a strategy for cadastral data within Europe. Cadastral strategy document is now delivered and will be reviewed by the OME2 final review panel and EuroGeographics needs to consider with its members how to progress.

Oliwia Marszalek explained that these datasets are required and being used, by the higher-than-expected user numbers, and positive feedback from users and stakeholder, which includes the pan-European topographic datasets, the High Value Large Scale Prototype (HVLSP) and the enhanced OCM. It is worth noting that the number of users increases monthly curve – even after 6 years continues – to go up. By the end of January, the figure of 21,500 unique users had almost been reached, with 600 unique users of the HVLSP (see Figure 5 below).

¹⁰ See presentation:

https://www.eurosdrr.net/sites/default/files/images/inline/6_20260209_omeandlicensing_marszalek.pdf

OME2: User Numbers



Copyright © 2026 EuroGeographics www.eurogeographics.org

Figure 5: Unique users' evolution of EuroSDR datasets from 2023 to 2025

Oliwia Marszalek put the spotlight on two use cases to illustrate how EG members data is being used in practice. The first one is University of Siena which is using topographic open data updated through OME2 to create a geological base map for the new Digital Structural Model (DSM) of Italy. Thanks to ERM the 1:250,000 scale vector geological map will cover not just Italy, but the entire Alps and neighbouring areas of France, Switzerland, Austria, Slovenia, and Croatia. The second one is Nazka Mapps. Nazka is an SME that uses the boundary data within an application because it is harmonised and thus useable. Furthermore, because the OME datasets are open, Nazka decided to make its solution open to give other map application builders access to accurate and up-to-date boundary information without the hassle of data collection and maintenance.

To capitalize on the OME2 and OCM projects' successes, EG launched in 2026 EuroCoreReferenceMap (ECRM), with the vision to create a new authoritative foundation for cross-border applications in Europe with harmonised and edge-matched data across national borders with consistent high-resolution topographic information from trusted official sources from national mapping agencies.

In the second part of her presentation, Oliwia Marszalek described EuroGeographics' journey towards open data over the past 5–10 years. Previously, EG licensed datasets for a fee, using the income to support member activities and production resources. However, growing demand from users for open, freely accessible data, alongside dwindling paying customers, created financial challenges for EG, a non-profit organization. Open data, though valuable, still incurs production costs. With many members making their national data open and no longer requiring supply fees, and with the influence of the Open Data PSI directive (which EG, though not obliged to follow, wanted to align with), a strategic review was necessary. By 2019, EG members voiced a preference for prioritizing data access over sales, aiming to simplify user access to both national and pan-European datasets. Earlier experiences—such as opening EuroGlobalMap in 2013—showed increased usage, guiding EG to seek European funding for future support.

Despite embracing open data, EuroGeographics still licenses EuroBoundaryMap and EuroRegionalMap for four countries. Members can use full datasets internally. There are five license types—distributor, value-added reseller, end-user, academic, and publishing. Licenses are typically annual but can be extended on request, ensuring broad and flexible dataset access.

In the third and last part of her presentation, Oliwia Marszalek gave some details on EuroGeographics pricing and data supply fees policies. Any income from licensing is fed back into the membership association. It supports some of the cost of the production of the datasets but doesn't cover it all.

2.4 Feedback's presentations from NMCAs

Eric Bayers is General Counsellor, and Jasper Beernaerts Partners Manager, both in position at NGI Belgium. As hosts of the workshop, they provided¹¹ to the audience an update on NGI Belgium strategic evolution since the 2024 Leuven workshop, where General Administrator Ingrid Vanden Berghe had introduced the concept of NGI as a geo-broker. Eric Bayers and Jasper Beernaerts demonstrated how this strategic positioning had matured over the intervening two years.

NGI Belgium operates as a federal administration under the tutelage of the Minister of National Defence. With a staff of one hundred ninety-six and an annual budget of approximately 25 M€, the agency faces very limited resources while confronting the same challenges as larger, better-resourced counterparts. The agency's missions encompass providing complete territory-covering reference data of homogeneous quality, supplying federal officials with necessary geographic information, disseminating federal geospatial information to government and private sectors, developing national geo-information infrastructure integrated with local, regional, federal and international systems, and supporting cooperation between different governmental levels.

The 2025 budget structure (see Figure 6 below) revealed high “dependence” on public subsidies (81.2%).

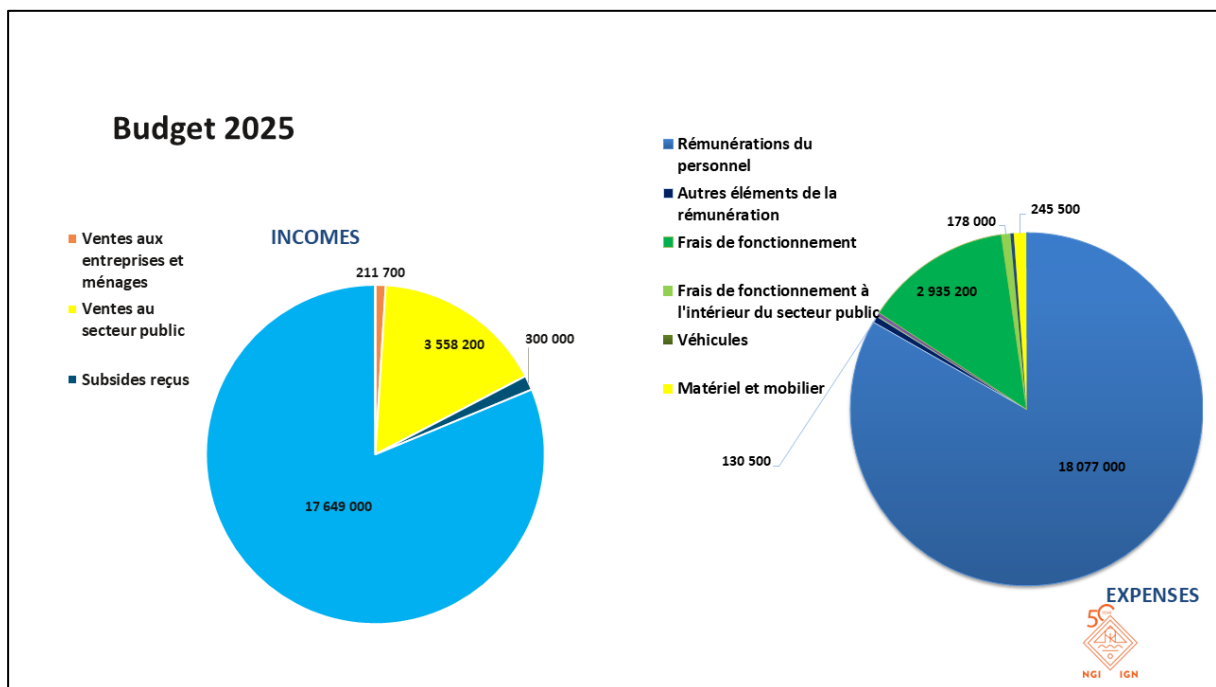


Figure 6: 2025 NGI Belgium budget

¹¹ See presentation

https://www.eurosd.net/sites/default/files/images/inline/1_20260210_ngi_belgium_eric_bayers_eurosd_busines_model.pdf

In the second part of their presentation, Eric Bayers and Jasper Beernaerts detailed the activities of NGI Belgium, which revolve around two complementary roles. As a data producer and integrator, the agency manages geodetic reference systems, provides the national reference for geographical coordinates and projections, coordinates the GPS-RTK service infrastructure managed by regional institutions, and produces core geodata including land use mapping and the non-navigable water network. The agency's topographic map viewer at topomapviewer.ngi.be provides public access to these foundational datasets.

The geo-broker role, however, represents NGI Belgium's strategic differentiation. The agency defines this role as determining the federal government's overall geodata and geoservices needs, bringing providers closer to end users by facilitating transactions, improving access and dissemination, studying markets to provide appropriate recommendations, and supplying additional geoservices and geosolutions based on its expertise. Priority partners include Defence, the crisis center for crisis management, other federal institutions, mobility management actors, and climate management stakeholders.

Nine concrete geo-broker activities illustrated this model in practice. The Geo.be federal geoportal provides discovery through INSPIRE, ISO, and DCAT-AP metadata catalogues alongside visualization capabilities. National and international INSPIRE coordination includes secretariat functions, working group participation, and a microservice for transforming INSPIRE metadata to geoDCAT-AP format. The Transportdata.be platform serves as Belgium's National Access Point for Intelligent Transport Systems (ITS). The LowAir and the Electronic Terrain and Obstacle Data (eTOD) products, with over thirty years of history for the first one, provide maps and geodata for air navigation serving defence requirements. Unified and shared cartography for emergency services employs a community-based approach coordinating fire brigades, medical intervention teams, and crisis response. Purchasing frameworks for geodata, particularly digital road networks, serve integrated police, emergency services, and multiple federal agencies. Collaboration with Google Map Pro involves facilitating contacts and negotiating common tariff scales for federal administrations. Climate change research collaboration and international representation round out the portfolio of geo-broker activities.

In the second part of their presentation, Eric Bayers and Jasper Beernaerts gave to the audience an update on the open data and HVD implementation challenge that had dominated the 2024 workshop discussion. In 2024, Ingrid Vanden Berghe had presented a thorough study estimating 3M€ per year in extra costs to comply with HVD requirements, with no funding secured at that time. Two years later, the situation had transformed. NGI Belgium had secured the full 3M€ annually for the next three years, thanks critically to support from the Ministry of Defence. Additionally, a staff reinforcement of seventeen people was planned for 2025-2026 to implement the detailed action plan for directive transposition.

However, securing funding revealed a new challenge. As Eric Bayers emphasized, the critical question had shifted from obtaining budget to human resources: "*Now we need to find them, recruit them, train them and retain them.*" In a competitive labor market for geospatial and IT professionals, even with secured funding, were recruiting and retaining the necessary workforce the new bottleneck?

Mikael Jenssen, Head of Business Models, and Anna Svedlund, Business Developer with a strategic focus, both in position at Lantmäteriet shared¹² the experience of the Swedish Agency in implementing the High-value dataset (HVD) regulation, aiming to give the most comprehensive accounts of HVD implementation, in a context of the complex interplay of multiple legal frameworks and the pragmatic solutions deployed under budget constraints. Sweden had been one of the countries which opted for an exemption from the HVD February 2025 deadline, with the Swedish government decision of March 2023 providing a fixed two-year extension for Lantmäteriet alongside the Companies Registration Office, Maritime Administration, Geological Survey, and Statistics Sweden¹³.

Therefore, the HVD implementation timeline began with the June 2019 EU Directive, followed by Sweden's August 2022 national Act on public sector making data available. After the February 2023 EU implementing regulation established the specific HVD list, Swedish government's March 2023 exemption provided breathing room until February 2025. By June 2024, no changes had yet occurred in Lantmäteriet's product offerings. The full transition to HVD availability occurred on February 9, 2025, exactly one year before the workshop.

Mikael Jenssen and Anna Svedlund indicated that **Sweden's implementation proved complex due to the intersection of three distinct legal frameworks constraining full open access.**

Firstly, the cadastral national legislation, embodied in the Real Property Register Act and Ordinance, required that all information from the Real Property Register be tested for its purpose before provision. This resulted in five HVD services being preceded by a form to ensure correct purpose: addresses downloads in vector Geopackage format, addresses direct access, building direct access, cadastral parcels direct access, and cadastral parcels downloads in vector format. This purpose-testing requirement introduced friction into the ostensibly open and free access mandate, creating **a hybrid model where data remained free, but access required justification.**

Secondly, the European General Data Protection Regulation (GDPR) presented unexpected complications. The definition of personal data had been broadening through European Court of Justice case law, requiring Lantmäteriet to conduct new assessments using an external law firm. Two datasets proved particularly affected by its conclusion: **orthophotos and buildings have been considered as personal data, which means specific conditions for provision.**

National security considerations introduced a third layer of complexity. Swedish law requires risk assessments at an aggregate level regarding national security implications of data availability. Risk exists if availability could lead to serious negative consequences for national defence, political independence, democratic governance, or critical societal functions. Lantmäteriet, working with other authorities, determined that providing hydrographic downloads via networks carried non-negligible risks. Consequently, **the hydrography dataset was exempted from HVD status.** It remained free of charge but **required special review before access was granted, creating a security-gated free data model.**

Finally, Mikael Jenssen and Anna Svedlund compiled a balance sheet for the current situation of Lantmäteriet HVD in Sweden: the access to all datasets is under account registration and login conditions, 8 out of 16 with specific restriction (see Figure 7 below).

¹² See presentation:

https://www.eurosdrr.net/sites/default/files/images/inline/2_20260210_sweden_bryssel_feb_2026.pdf

¹³ See decision (in Swedish):

<https://www.regeringen.se/contentassets/9bb49451587c4e5d8a783c4be57128f4/undantag-fran-kravet-att-tillgangliggora-sarskilt-vardefulla-dataset-avgiftsfritt.pdf>

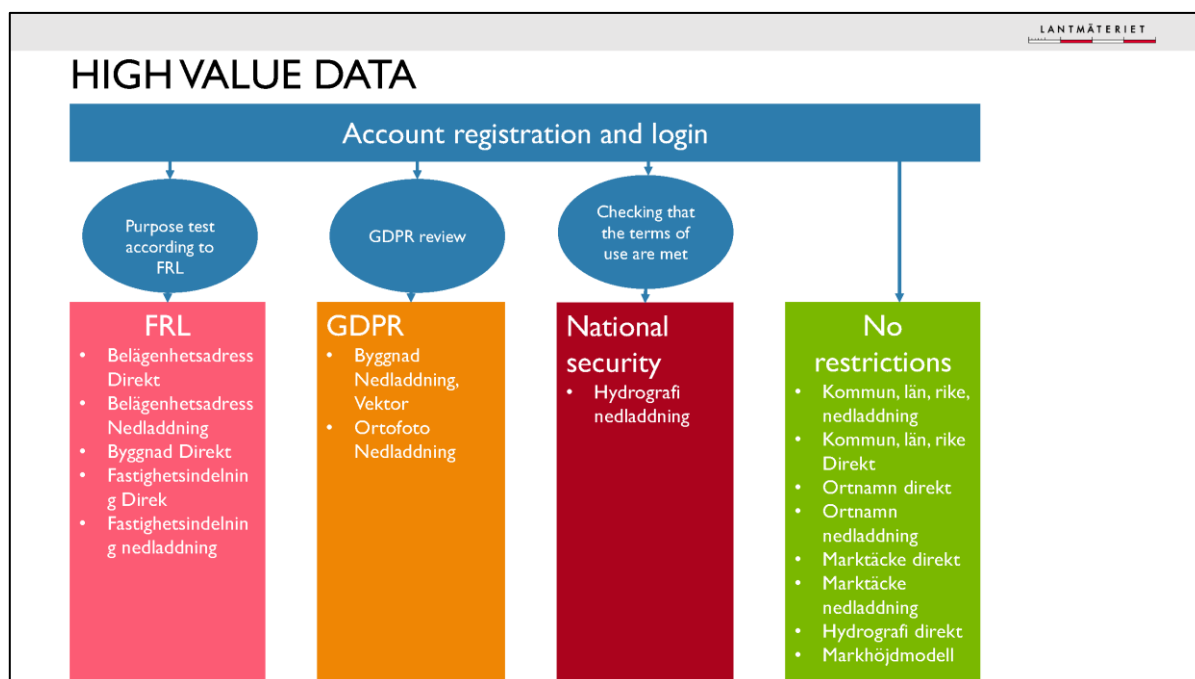


Figure 7: Provision status of the 16 Lantmäteriet High-value datasets

In the last part of their presentation Mikael Jenssen and Anna Svedlund addressed the financing dimension of HVD implementation. When HVD implementation became imminent, the agency calculated estimated needs based on both lost user fees and increased costs, assuming demand would increase tenfold compared to 2023 levels. The budget request totalled 15.7M€. The government allocated 9.5M€. Adaptation to this forty percent budget shortfall required three measures: cost reduction through operational efficiencies; still charging user fees for geographical data not designated as HVD and for WMS services; Streamlining IT infrastructure for additional savings.

The outcomes demonstrated validation of the open data value proposition despite inadequate funding. Lantmäteriet faced a strong growth in both the Geodata support platform activity and new accounts in the Geotorget distribution platform, with a notable spike following HVD implementation in February 2025.

Bert Beentjes, Senior Strategy Advisor at Kadaster (The Netherlands) shared¹⁴ with workshop's attendees an update on the Dutch Agency situation he exposed two years before (*"under financial stress"*) in Leuven. Fortunately, it has improved, thanks to a mix of cost reduction, price increases and improving market.

Then, Bert Beentjes underlined that Kadaster have currently three business models: 1. Consumer product pricing: B2B and B2C; 2. Consumer hour pricing: B2B; 3. Central budget: open data and shared services. Income streams are separated at the level of registries or services, and this is codified in law and reflects in the governance structures. But strategic trends towards combined and federative data could undermine these business models in the coming years. According to him, this could represent an emerging and potentially transformative dimension for NMCA business models.

Data combination means multiple sources, different models, and data federation multiple partners, different models (See Figure 8 below). Data federation is a model where data remains with its

¹⁴ See presentation: https://www.eurosd.net/sites/default/files/images/inline/3. 20260210_eurosd - kadaster - the impact of data combination and federation on business models.pdf

owner/manager. Data is shared in a controlled and secure manner. Unlike centralization, each organization maintains control over its own data.

The *Federatief Datastelsel*¹⁵ or FDS (Federal Data System) is a framework of agreements that enables in the Netherlands governments and organizations with public tasks to share and use data safely and responsibly. The joint agreements ensure that governments work based on the same standards, allowing them to handle data in a uniform way. The FDS is a concrete implementation within the *Interbestuurlijke Datastrategie*¹⁶ (Intergovernmental Data Strategy - IBDS).

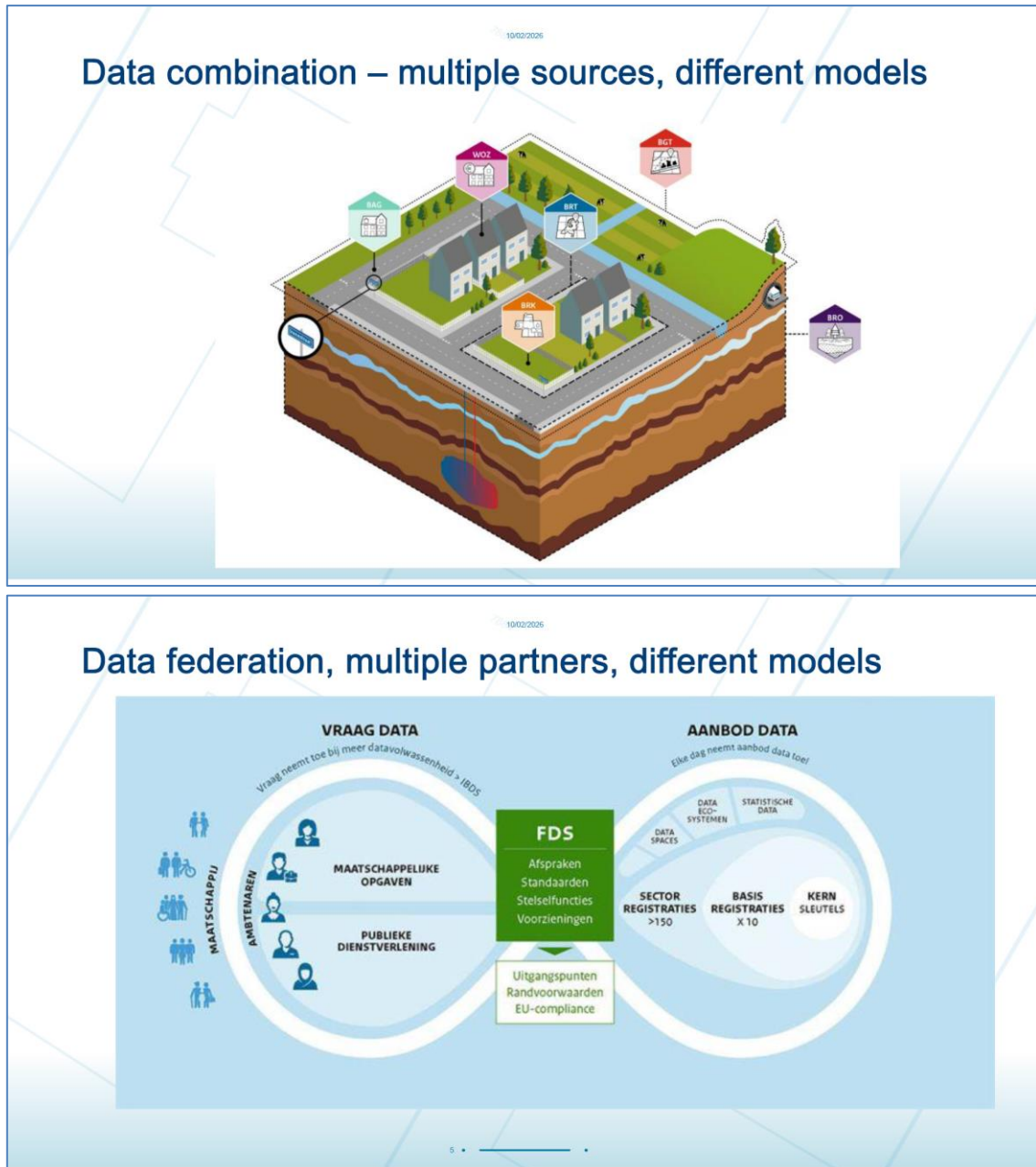


Figure 8: Data combination and data federation, potentially transformative dimension for NMCA business models

¹⁵ See (in Dutch): <https://federatief.datastelsel.nl/>

¹⁶ See (in Dutch): <https://www.digitaleoverheid.nl/overzicht-van-alle-onderwerpen/data/interbestuurlijke-datastrategie/>

Bert Bentjees indicated that using combined data and designing products for combined data requires harmonization of business models, which is not so easy. Data federation makes data from multiple sources available in existing and new sectors, oftentimes through intermediaries which is a complex situation to set-up a business model, if it is even possible (see Figure 9 below). He shared with the audience honest acknowledgment that while the direction appeared promising, the path forward remained unclear.

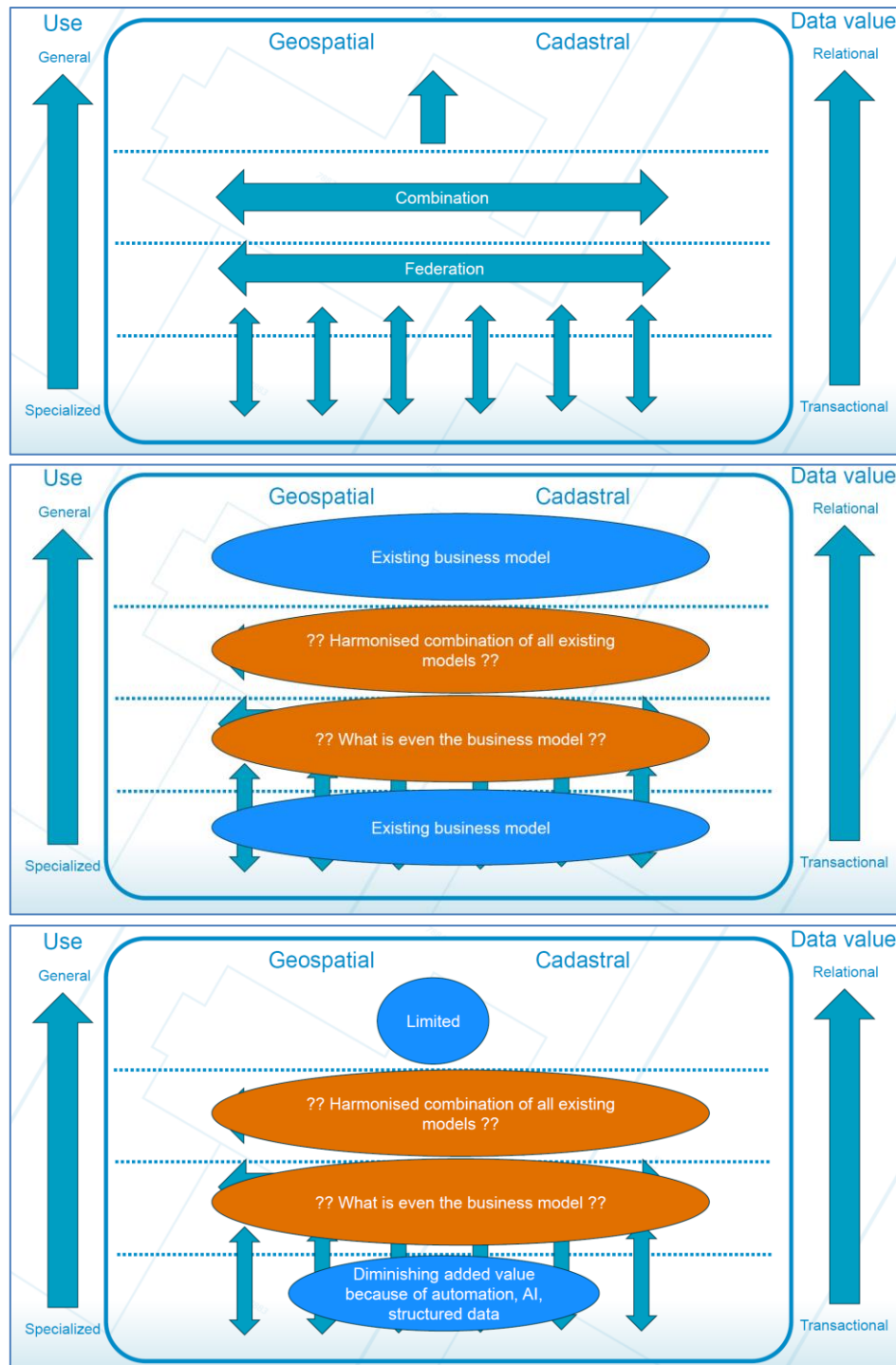


Figure 9: How to find adequate NMCA Business model when you add data combination and data federation models in the existing landscape?

Given that centralizing governance and finding additional budget are both difficult, Bert Bentjees suggested that the only way to going forward seems to try new solutions, in a test and learn approach such as fees for professional use, fees from data federation or fees for home buyers and/or homeowners. Yet he emphasized the need to continue closely monitoring data quality.

After a quick presentation of **National Land Survey (NLS) of Finland**, where there are both in position, **Jani Kylmäaho as Director of Development and Digitalization** and **Heli Laaksonen as Director in Charge of Basic Spatial Data Services** shared¹⁷ with the workshop's attendees how NLS Finland is attempting to secure its sustainable Business Models and productivity.

The KALLIO program represented the cornerstone of Finland's approach and was presented during the Leuven workshop two years before. KALLIO 1, operating from 2020 to 2025, established aerial images on a three-year cycle producing 50cm orthophotos, and laser scanning point clouds on a six-year cycle at 5points/m². The program's motto captured its essence: *"Together. Efficiently. More."* Partners included five organizations under the same ministry of agriculture and forestry plus the Defence Forces.

KALLIO 2, beginning in 2026, represented significant expansion and enhancement. Aerial images would now be captured at 30cm on a three-year cycle covering approximately 110.000km²/year. Laser scanning would increase to 20points/m² on a nine-year cycle covering roughly 37.000km²/year. Additional laser scanning at 5points/m² would continue from 2026 to 2031, covering between 6.000 and 19.000km² annually. The expansion included also additional partners beyond the original consortium. The evolution of point density in national laser scanning datasets since 2008 showed dramatic improvement, with the jump to 20points/m² representing a quantum leap in data quality and utility. This data supported a wide range of high-impact applications including forest data production and updates, field monitoring for agricultural subsidies, national topographic database updates, flood mapping, transport infrastructure planning, soil mapping, archaeological site documentation, and numerous research projects. Critically, all data was made available as public or open data to benefit Finnish society, embodying the "more with less" principle where collaboration enabled greater coverage and quality than any single organization could achieve independently.

The LiDAR Processing Platform represented is a secure processing environment for geospatial datasets, owned by NLS Finland and maintained by the IT Centre for Science. It was originally intended for processing datasets produced under the national aerial image and LiDAR programme. The platform offered five key benefits: centralized environment for secure processing of laser scanning, aerial imagery, and organizations' own geospatial data; automatically updated source datasets from NLS systems; jointly agreed data products for organisations; significant cost savings resulted from establishing the secure environment once, centralizing source datasets, reducing storage needs, and sharing production of derivative products; finally, the platform increased data usage and learning across participating organizations.

A Platform 2.0 vision, still conceptual, proposed scaling use to support a wider range of use cases and more organizations including municipalities. Each organization would produce and use data on a shared platform. This would potentially reduce dependence on public cloud services, enable secure AI solutions making broad use of public-sector geodata, reduce overlapping work between organizations, create common situational pictures in exceptional circumstances, and support decision-making. The vision remained aspirational but illustrated Finland's continued innovation in collaborative infrastructure.

¹⁷ See presentation:

https://www.eurosdrr.net/sites/default/files/images/inline/4_20260210_securing_the_sustainable_business_models_of_nls_finland_jky.pdf

Jani Kylmäaho and Heli Laaksonen indicated that these very successful projects must face since 2024 some cloud on the horizon, with disruptive factor for the execution of aerial surveys due to the geopolitical situation. Indeed, **two large areas on the Eastern side of Finland** (see Figure 10 below) **are affected by GNSS jamming**. The challenge is to be able to reuse old positioning methods without GNSS in the process.

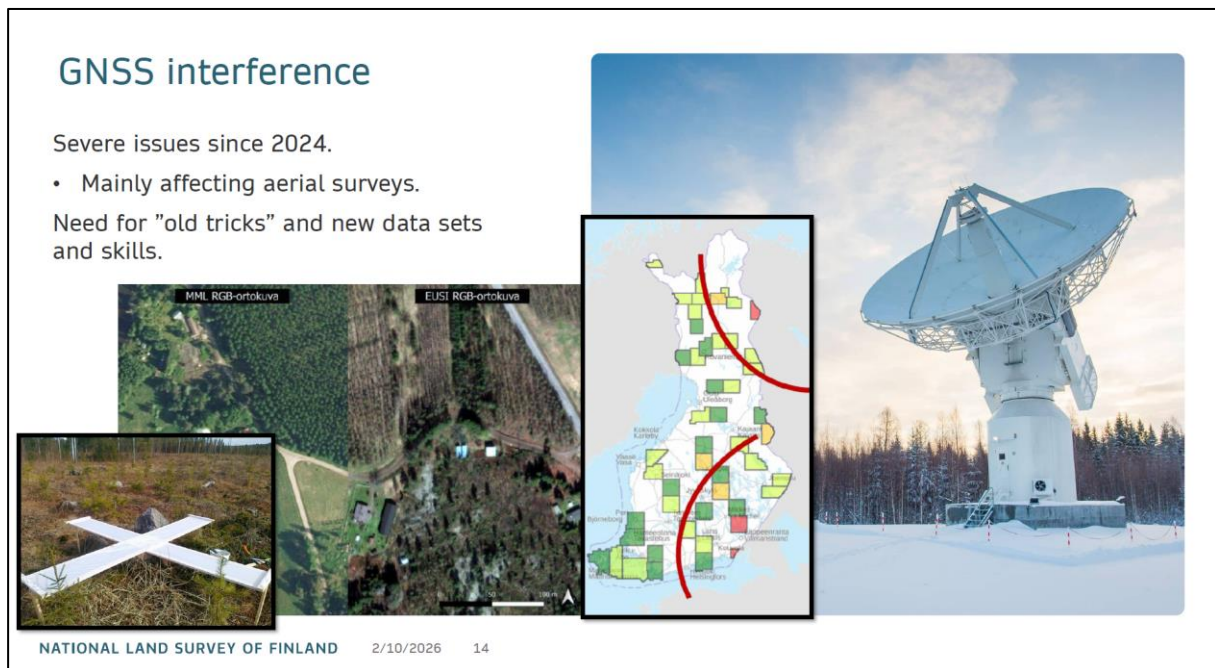


Figure 10: Two large areas affected by GNSS jamming on the Eastern side of Finland

In the following part of their presentation, Jani Kylmäaho and Heli Laaksonen shared few examples of how NLS Finland strive to improve the strategic impact and financial resilience through research, technology development, sustainable IT, thanks to Machine Learning (ML) and Artificial Intelligence (AI) as well as collaboration.

A method for identifying and vectorizing new or missing buildings has been developed. Even if it was still finalizing—there are issues with areas of high tree coverage and some other erroneous results – the results for the new 20 points/m² laser scanning materials, the results are likely to improve drastically. Another example is a method to calculate the slope and width of the road, which are important for the Finnish Traffic Administration and the logistics branch. This method has been piloted successfully with the Traffic Administration and will be implemented in production use soon.

The watercourse detection is another example: there are tens of thousands of kilometres of ditches in Finland, which also change surprisingly lot due to forestry actions. The topographic database is not up to date on this part, but also for this data theme NLS Finland hope to gain better coverage and topology with ML algorithms. Obviously, the same challenges apply – how to retain topology when there is a lot of trees and vegetation blocking the view to the ditches. The work on this is going on with scientists.

Several Generate AI use cases are also in development or planning. Automated extraction of information from real property ownership transfer registration applications, including interpretation of semi-structured and unstructured PDF information, have funding being applied from the Finnish Innovation Fund AI program. Supporting solution development with GitHub Copilot is starting as an internal pilot to establish procedures and verify expected 20% - 30% productivity improvements. Development of automated methods and a dashboard for knowledge management and foresight using enterprise and statistical data is possibly seeking funding from the Finnish Ministry of Finance AI program.

In the last part of their presentation, Jani Kylmäaho and Heli Laaksonen explained **how Open source (OS) is used as enabler of NLS Finland Business Model**. The rationale is based on five points:

- Building an enterprise architecture under their own control stands as the primary motivation. This approach allows the organization to develop production tools tailored to actual process needs, rather than adapting workflows to fit predetermined software constraints. Closed source products frequently impose rigid setups and working methods, whereas maintaining architectural control over core business operations offers greater flexibility and autonomy.
- Collaboration with other public sector organizations through open platforms ensures sustainable and efficient operations. By tapping into the innovative expertise of global OS communities, the organization gains significant advantages. However, this relationship requires reciprocity: contributing back to these communities and developing solutions that benefit the broader ecosystem creates resilience in the face of constant change.
- The Finnish Geospatial Research Institute (FGI), an integral part of the NLS Finland, conducts cutting-edge research in areas like Machine Learning, predominantly using OS tools. Aligning production systems with these same tools naturally enhances productivity and innovation transfer.
- OS enables modular architecture, where well-defined APIs ensure component interchangeability and interoperability. The reliance on standards simplifies lifecycle management and allows engagement with a diverse vendor ecosystem for system support and development.
- OS provides robust protection against vendor lock-in and unexpected business disruptions. A recent example illustrates this perfectly: the organization received notice of 80-100 percent annual price increases for certain licensed products. By avoiding such unpredictable licensing costs, resources can be redirected toward developing meaningful productivity improvements for daily operations.

The EU's goal of digital sovereignty—reducing dependency on major tech corporations—aligns perfectly with this strategy. **The best path toward genuine sovereignty lies in using and developing OS software that simultaneously benefits the global community.**

Practically, as now the new topographic dataset production system is based on OS, and Geospatial data production is a mission critical duty and core business of NLS, ensuring sustainability and security of the production system, based on QGIS software matters. As QGIS is used by quite a few public sector organizations in Finland, a collaboration network to support together the maintenance of the core QGIS solution. Co-funding or Crowd funding mechanisms can be used to fund development, which saves money if there is common interest. As a result of this collaboration, NLS Finland is now a Flagship level Sustaining member of the QGIS Community.

In their conclusion, Jani Kylmäaho and Heli Laaksonen indicated that NLS Finland will keep improving use of ML/AI as means of increasing productivity and continue to work on securing national and European Digital Sovereignty. And questioned the audience: will there be a European Core Geospatial Data Space, which could in turn be leveraged by other sectors, Data Spaces as a mechanism supporting new Business Models?

Teimuraz Gabriadze from National Agency of Public Registry (NAPR) of Georgia and Glenn Vancauwenberghe from GEONOTGEO developed in their presentation¹⁸ the work done to lay down a Sustainable Business Model for the Georgian National Spatial Data Infrastructure (NSDI).

The National Agency of Public Registry operates as a legal entity of public law under the Ministry of Justice, established in 2004 with missions encompassing land registry and cadastre, digital services, and geospatial infrastructure.

¹⁸ See presentation:

https://eurosdnet/sites/default/files/images/inline/5_20260210_-_eurosdnet_nsdigeorgia.pdf

Georgian's Agency digital transformation journey (see Figure 11 below) started in the 90s and after different stages led to the launch of more than 300 e-services. This remarkable work encountered international recognition: the World Bank Business Ready 2024 assessment ranked Georgia first globally in the Immovable Property component, evaluating immovable property registration standards, information transparency, and digital service accessibility and reliability.

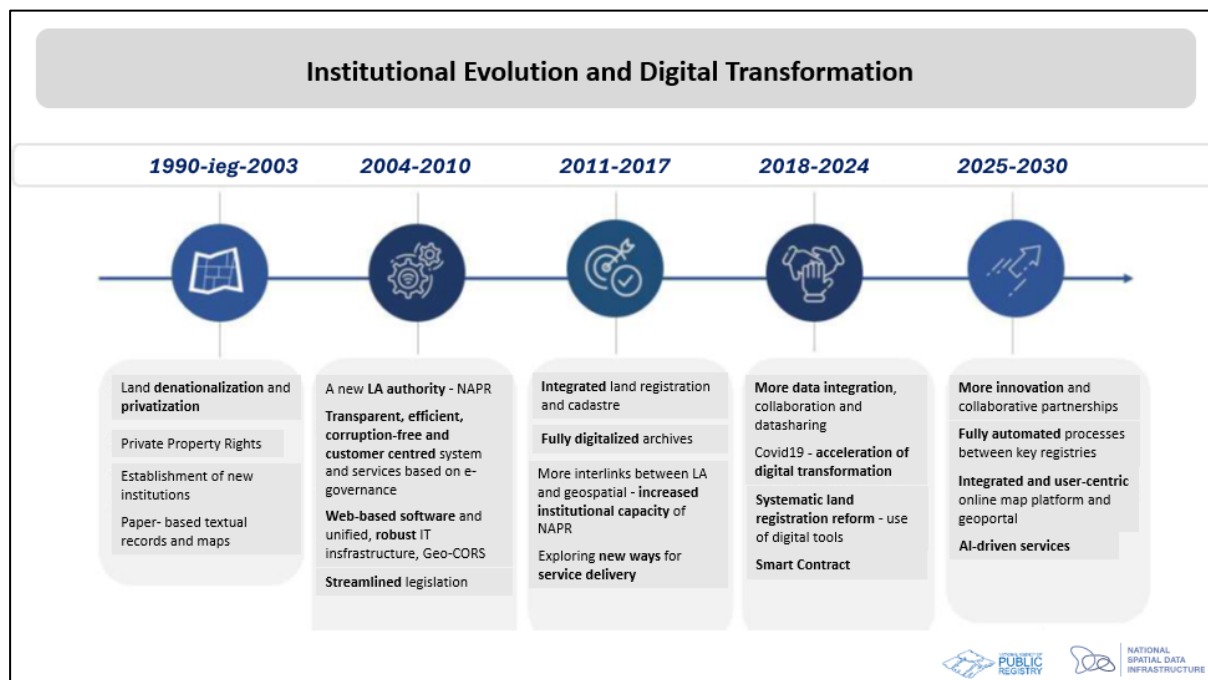


Figure 11: National Agency of Public Registry of Georgia's digital transformation journey

Service delivery operates through a unified portal of e-services at my.gov.ge and the agency website at napr.gov.ge, providing decentralized access across the territory. The digitalization of systematic land registration achieved over 95% cadastral coverage with 49% of registered owners being women, demonstrating both technical achievement and social equity. Technologies employed included Electronic Minutes Application (EMA), an on-field registration data collection and processing application, drones, orthophotos, and GeoCORS networks (Continuously Operating Reference Stations deployed in Georgia)¹⁹, with development conducted in-house rather than through external vendors, ensuring institutional capacity and avoiding vendor lock-in. Processes featured digitalized systematic land registration, optimization of procedures, live registration features, and electronic minutes applications. International experts from the World Bank recognized Georgia's systematic land registration methodology and technological solutions as exemplary globally.

Teimuraz Gabriadze and Glenn Vancauwenberghe put also on the spotlight in their presentation the Smart Contract by NAPR which represents cutting-edge innovation in property registration. This service enables rapid and secure registration of immovable property with subsequent payment of purchase price completed in under 15 minutes. The entire process could be conducted remotely from home, utilizing AI-based facial recognition and identification features. The ecosystem is evolving beyond mortgage and purchase registrations, with the next stage envisioning tokenization of assets and blockchain integration.

Maps.gov.ge is an interactive portal, precursor to the NSDI geoportal, providing access to cadastral data, land titles, and transport networks. Between 2024 and 2026, significant NSDI development progress occurred. An NSDI logo and brand book were created. A solution architecture document for the National Geoportal was developed. Publication of spatial data and metadata on the Georgian National Geoportal

¹⁹ See <http://geocors.napr.gov.ge/SBC/spider-business-center>

began. A basic diagnostic tool was created to assess readiness of NSDI subjects. Recommendations from international consultants were being incorporated. Informational meetings with NSDI subjects were underway.

The NSDI development strategy and action plan established policy and coordination mechanisms through a defined governance structure. International cooperation supported development, with various partners contributing technical assistance and knowledge transfer. Support for development of NSDI policy documents occurred from 2024 to 2025 through structured programs.

A comprehensive study on access, use, and sharing of spatial data in Georgia gathered input from 14 key stakeholders spanning multiple sectors. Feedback on current and future Business Models was collected: the mostly adopted models for sharing geospatial data are 1) open data; 2) open data for non-commercial use and 3) mixed (freemium) models, in which only basic versions are made available for free. Data sharing within the public sector usually is for free, but standard – open – licenses are hardly used. There are only a few data providers that generate revenues from selling geospatial data and/or services relying on these data. Some data providers have a pricing mechanism in place, which in some cases is determined in a bi-law or a decree. Open data for non-commercial use is considered by most stakeholders as the most favourable model to be applied as the standard model for the NSDI in Georgia. There is a strong interest to keep track of the users of the data, even in case of open data (e.g. through an authentication and authorization mechanism).

Moreover, an international benchmark on some NSDI best practices was lead (Geovekst, Norway; GDI-DE, Germany; pdok, The Netherlands).

Considering different models, mechanisms, and instruments, Teimuraz Gabriadze and Glenn Vancauwenberghe identified four types of measures to promote and enforce compliance with the partnership model. Promotion and capacity building (workshops, training, guidelines, ...) would encourage participation and develop skills. Corrective and reputational measures (compliance dashboards, naming and flagging, support for remediation, ...) would address non-compliance through visible consequences. Technical and procedural enforcement (metadata validation, publication gatekeeping, ...) would embed requirements in systems and workflows. Legal and administrative enforcement (enforcement notices, escalation to central authority, fines, ...) would provide formal mechanisms for ensuring participation. This comprehensive approach balanced incentives with requirements, recognizing that sustainable participation required both motivation and obligation.

The presentation emphasized balancing short-term gains with sustainable long-term solutions. Quick wins could build momentum and demonstrate value, but the ultimate objective required institutional changes and capacity development that would take time to mature. This temporal dimension acknowledged that building a National Spatial Data Infrastructure represents a multi-year journey requiring sustained commitment and resources.

In the last part of their presentation Teimuraz Gabriadze and Glenn Vancauwenberghe revealed the roadmap for the future evolution of the Georgian NSDI Business Model given that making geospatial data in Georgia easy to find and discover (through clear and complete licensing information) is the starting position. The first stage (data sharing) is providing free access to all NSDI resources for government organizations (through a standard license). The next one (High-value data) is to create and deliver High-value datasets, through new and improved data acquisition processes. The last and final one (data use) aims to enhance the use and integration of geospatial data (through open data and location-enabled services).

In the first part of his presentation²⁰, **Frédéric Cantat, IGN France's Referent for Collaborative Innovation and Collective Intelligence Methods and Chair of EuroSDR's Commission on Business Models and Operations**, shared with the workshop attendees the journey IGN France did from a full fee to a full open data model.

From the 70s to 2000, the prevailing philosophy for IGN France as a public establishment, placed under the supervision of various ministries over the years and through changes of government, was straightforward: *"your data and documents are valuable, so value them — and keep valuing them."* Around 2005, a first tension emerged when fees exceeded public fundings, revealing the limits of fees and non-discriminatory terms and conditions for a public body. Some colleagues in the public sector have made a habit of saying: *"Hey IGN, we pay twice! Why should we work with you?"* Then came the hit of the 2010s: *"you must find a new Business Model!"*, followed by the hit of the mid-2010s: *"Is it still useful to hold a French NMA when we have Google Maps and OSM for free?"* In 2010 and 2011, the first free licenses were introduced, covering Research and Education purposes across all datasets, as well as some datasets for carrying out a public service mission. In 2017, the French Digital Republic Law entered into force (In France, Use of Public datasets became free by default for all purposes, fees became the exception), and in 2021, IGN made the switch to full open data, on its own.

In the second part, Frédéric Cantat explained how IGN France's business model was "under the spotlight and microscopes" since 2010s, with a continuous succession of inspection or audit missions. In 2013, a Report to the French Prime Minister by Mohammed Adnène Trojette raised a pointed question: *"Opening up public data: Are all exceptions to the principle of free access legitimate?"* It also put forward the notions of open data and Government as a platform through APIs. Then came 2018, a pivotal year shaped by three simultaneous events. First, a Report to the French Government by Valéria Faure-Muntian on "Sovereign geodata" acted as a counter-fire. Second, the Cambridge Analytica scandal shook the political world and levelled up the concepts of extraterritorial influence and sovereignty. Third, a unilateral and unforeseen modification of the tariffs applied to Google Maps services sent a strong warning signal. In 2024, a Report by a French Governmental Public Audit team addressed to the French Sustainable Development Minister examined the "Business model for Public organisations: the cases of IGN and CEREMA", concluding that *"a financial support through an urgent readjustment of funding rates for 2024 and 2025 seems essential."* That same year, the French Senate Finance Committee Report by Senator Vincent Capo-Canellas sounded *"an alert regarding the failure to take into account the underfunding of IGN, which is facing a budget shortfall of 15 M€."*

In the third part, Frédéric Cantat pointed that funding the core activities is the current core issue for IGN France. The total costs of the core activities — research and education, geodesy, altimetry, orthoimage, point clouds, topography and cartography — are not fully covered by the subsidies for public service obligation paid annually to IGN. Some projects are, however, totally funded, such as the Large-scale Land Use database (in support of soil sealing and biodiversity French Public Policies), the French national agricultural parcels database (for EU Common Agricultural Policy management), among others. Others could only be partially funded, such as Lidar HD at 53 M€ out of 58 M€ for the first coverage, with some ongoing reflections for a potential update, or Digital Twins, for which 26 M€ were allocated to 14 partners to develop a POC within 3 years.

In the fourth part of his presentation, Frédéric Cantat insisted on that closing the financial gap represents a very high challenge for IGN France. Indeed, its strategic positioning is to support French Public Policies as the key player in national data, aiming to reinvent the map for all public policies. Yet French Public Finance is in the dark red, creating a "malus effect" through cuts in budget and HR both for IGN France and for its stakeholders. Several solutions have been deployed to bridge the gap of 15 M€. On the productivity side, automation and Geo-AI are being leveraged, supported by a task force of 30 experts in Geo-AI. On the strategic side, IGN is focusing on Digital Commons, including datasets such

²⁰ See https://www.eurosd.net/sites/default/files/images/inline/6.20260210_-_eurosd_eurogeographics_sbm4nmcas_workshop_ign_france.pdf

as the French National Address Database, Panoramax (the free alternative to photo-mapping territories solution²¹) and Community sourcing ('BD France'), as well as digital tools like 'Géoplateforme', Local Data Factory and Digital Twins for Territories. In this spirit, IGN also promoted digital commons in its contribution²² to the recent "European Open Digital Ecosystems" consultation by DG CONNECT.

Beyond these internal efforts, financial support remains a hope, as does political support, for example through a French Prime Minister "circular" inviting French Public Administration (Ministries and public operators) to fully use resources and knowledge provided by IGN France. Finally, in a marketing approach a recasting of the offer is planned for Early 2026, built around 6 bricks and 4 claims (see Figure 12 below).

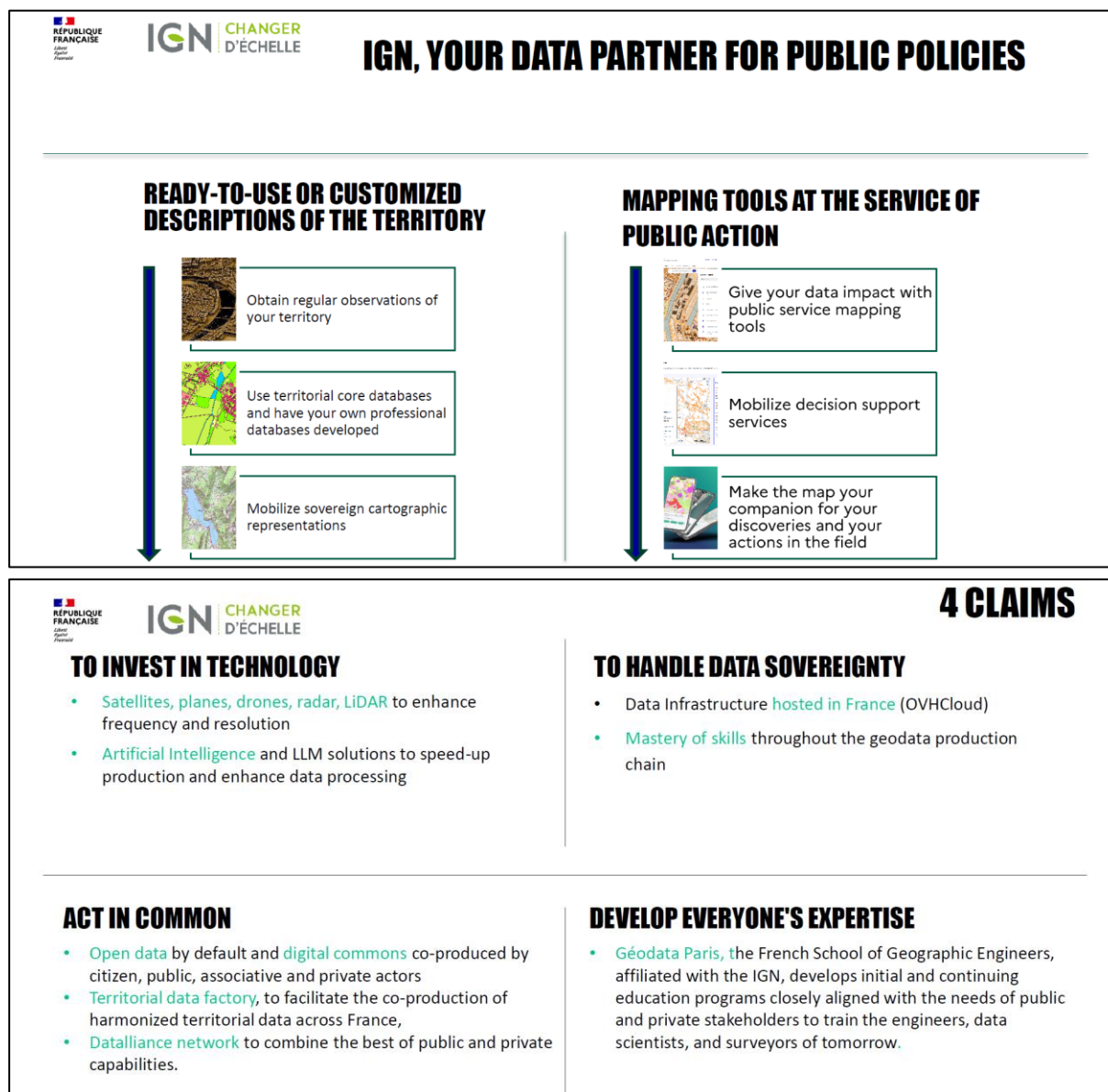


Figure 12: An offer structured in 6 bricks and 4 claims to move forward

²¹ See <https://panoramax.fr/>

²² See https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/16213-European-Open-Digital-Ecosystems/F33370373_en

To conclude, Frédéric Cantat underlined that IGN France is still looking for a sustainable business model (glass half empty). But (glass half full), the issue of reaching a balanced budget is now a subject shared with all stakeholders, and "*you must find a new business model*" and "*Is it still useful to hold a French NMA*" are not a hit anymore. A clear political support has also emerged, and the journey, while unfinished, is far from over.

Conclusion

Two years after the Leuven workshop, where participants had identified the February 2025 HVD deadline as a crucial turning point, the Brussels workshop provided a sobering assessment of the post-implementation reality. The regulatory deadline had passed, and EU National Mapping and Cadastral Agencies had navigated the transition to providing High-Value Datasets free of charge with varying degrees of success.

The Post-HVD Landscape

The workshop revealed a highly heterogeneous picture across European NMCAs. Belgium's NGI had secured full funding of 3M€ annually through its connection to the Ministry of Defence, successfully implementing a GeoBroker model that positioned the agency as facilitator and aggregator rather than merely data producer. However, even this success story faced a new challenge: recruiting and retaining qualified staff in competitive labor markets despite secured funding.

Sweden's Lantmäteriet achieved HVD implementation with 60% of requested funding, deploying a pragmatic hybrid model where HVD datasets were provided free while non-HVD data and services remained fee based. The Swedish experience illustrated the legal complexity of implementation, navigating cadastral legislation requiring purpose testing, GDPR evolution affecting orthophotos and buildings, and national security concerns leading to hydrography being exempted from HVD status. Despite partial funding, usage metrics showed strong growth in both the Geodatasupport platform and new Geotorget accounts, validating the open data value proposition.

Finland's National Land Survey demonstrated perhaps the most mature sustainable business model through the KALLIO collaboration program. By pooling resources across multiple public organizations for aerial imagery and LiDAR acquisition, combined with a shared processing platform and operational artificial intelligence applications achieving twenty to thirty percent productivity gains, Finland had moved beyond HVD compliance to comprehensive open data provision supported by systematic mutualization and innovation.

In contrast, IGN France continued to face a 15M€ budget shortfall despite full open data provision since 2021, Prime Ministerial endorsement in September 2025, strategic repositioning around digital commons, and deployment of a thirty-expert Geo-AI taskforce. Multiple audit reports had acknowledged the underfunding, yet the gap persisted. IGN France remained still looking for a sustainable business model.

Georgia's National Agency of Public Registry offered a counterpoint as a non-EU country achieving very good performance. Ranked first globally by the World Bank in the Immovable Property component, Georgia operated a fee-based service excellence model with cutting-edge smart contracts enabling fifteen-minute property registration, AI-based identification, and planned blockchain tokenization. This model demonstrated that sustainability was achievable when service fees could fund continuous innovation, though Georgia's EU candidacy status raised questions about future adaptation to European open data requirements.

Beyond HVD: Emerging Strategic Dimensions

The workshop expanded significantly beyond narrow HVD compliance concerns to explore five emerging strategic dimensions. Digital Twins emerged as a critical new context for NMCA data, with Jack Metcalfe's research demonstrating that while NMCAs provide foundational infrastructure for Digital Twin systems, traditional value assessment methodologies underspecify this contribution. The core challenge appeared to be not recognizing value but making it legible to funders, a gap that eight of fifteen surveyed NMCAs identified as insufficient funding despite understanding their importance.

Data federation represented another emerging direction, with Kadaster in The Netherlands exploring how combining cadastral and geospatial data with third-party sources could create new integrated

services. Critical questions remained unresolved about governance, quality assurance, liability, and potential revenue models targeting professional users, federation partners, or citizens directly.

Artificial intelligence transitioned from experimental to operational status, with Finland demonstrating measured productivity gains and IGN France deploying a substantial Geo-AI taskforce. The shift toward AI-ready data, as emphasized in Jordi Escriptu's JRC presentation, meant NMCAs must ensure their data possessed not just openness but appropriate structure, semantics, documentation, and quality metadata for machine learning applications.

Digital sovereignty emerged as an explicit strategic priority, particularly in Finland's Open Source First strategy and QGIS Flagship membership. The JRC positioned this not as isolation but as capacity to exercise technological autonomy and make independent choices. Emerging challenges like GNSS interference issues affecting aerial surveys since 2024 highlighted vulnerabilities in technological dependencies.

The INSPIRE evolution toward version 2.0 and the Green Deal Data Space represented regulatory simplification, removing rigid interoperability requirements and dedicated geoportal obligations while maintaining coordination, metadata, and thematic coverage requirements. Whether this simplification would genuinely reduce burden or create transition complexity remained to be seen.

Five Business Model Archetypes

The workshop presentations revealed five distinct approaches to sustainable business models. The GeoBroker model, exemplified by NGI Belgium, positioned the agency as facilitator and aggregator, mutualizing procurement and facilitating access rather than selling data directly. Value derived from demonstrable service to priority partners in defence, emergency services, and climate management.

The Collaboration-Mutualization model, demonstrated by Finland's KALLIO program, orchestrated multi-organization data acquisition achieving economies of scale and shared infrastructure. Success depended on mature institutional collaboration with measurable collective benefits sufficient to justify adequate public funding.

The Data Federation model, emerging at Kadaster Netherlands, envisioned aggregating diverse data sources into integrated services targeting professional users, federation partners, and potentially citizens. However, quality assurance, liability, and governance questions remained unresolved.

IGN France's Digital Commons model positioned the agency as key player in national data supporting public policies through open data, commons co-production, and sovereignty. While securing political support and Prime Ministerial endorsement, financial sustainability remained elusive with core funding gaps persisting despite project-based funding for specific priorities.

Georgia's Service Excellence model operated fee-based services with cutting-edge innovation, where world-class service quality drove volume and trust. Service fees funded continuous research and development, enabling technological leadership, though this model existed outside European HVD constraints.

The Sustainability Paradox

A fundamental paradox emerged from the workshop discussions. Excellence, relevance, and political support did not guarantee sustainability. IGN France demonstrated all three yet faced persistent budget gaps. NGI Belgium secured funding but confronted human resource challenges. Only Finland, through institutionalized multi-organization collaboration, and Georgia, through fee-based services outside HVD constraints, seemed to achieve sustainability for a while.

The difference between sustainable and struggling NMCAs appeared to be structural rather than technical. Finland benefited from established collaboration mechanisms across government. Belgium's direct connection to Defence, a priority ministry, secured funding. Georgia's fee-based model remained

unconstrained by open data mandates. France's comprehensive openness lacked matching core funding. Sweden's partial funding necessitated hybrid revenue approaches.

Jack Metcalfe's research highlighted what might be termed the legibility gap. NMCAs understand the value they create through foundational infrastructure, public good characteristics, interoperability standards, and spillover effects. However, this infrastructure-like value proves difficult to capture in traditional business case methodologies that funders recognize and act upon. When eight of fifteen agencies identify insufficient funding as a barrier yet only three say their value is unclear, the problem is not value recognition but value communication.

Open Questions for the Future

Several critical questions remained unresolved. First, is sustainability achievable under the current model? If IGN France with its full open data provision and political endorsement still faces 15 M€ shortfalls, does this suggest structural or national unsustainability of EU NMCAs' business models rather than simply implementation failures?

Second, is Finland's collaborative model replicable? KALLIO's success depends on institutional culture, ministerial alignment, and mature collaboration mechanisms. Can this transfer to countries with different governance structures and institutional histories?

Third, how should NMCAs navigate evolving GDPR jurisprudence? Sweden's experience showed the definition of personal data broadening through European Court of Justice case law, affecting orthophotos and buildings. Balancing open data mandates with privacy protection requirements will likely grow more complex.

Fourth, what roles should NMCAs adopt in Digital Twin ecosystems? Options range from foundational data provider, capturing lowest value, through orchestrator and facilitator roles with medium value capture, to service integrator positions with highest value potential but most competition.

Finally, should the European Union reconsider blanket open by default requirements? And what about sensitive data in an evolving geopolitical context with the rise of the transposition in the geodata ecosystem of the Open science claim: "as open as possible, as closed as necessary"? Even, all other things being equal, if these two hypotheses are currently unlikely as claim for open data and open source to strengthen sovereignty is pushed at the European level. Georgia's success with fee-based models achieving world-class performance suggests alternative paths may exist. Whether differentiated approaches allowing some revenue generation for sustainability might be preferable to uniform free provision merits examination.

Looking Ahead

Participants agreed on the necessity of continued dialogue and monitoring. Short-term priorities include tracking whether agencies like Belgium can successfully recruit and retain staff despite secured funding, monitoring whether France's Prime Ministerial circular and 2026 marketing update of its offering improve sustainability, following which NMCAs successfully position themselves in emerging Digital Twin ecosystems, and verifying Finland's claimed 20-30% AI productivity gains as adoption spreads.

Medium-term priorities encompass evaluating INSPIRE 2.0 simplification impacts on NMCAs' operations, assessing the EuroCoreReferenceMap project's post-2028 sustainability, tracking whether Data Spaces create new business model opportunities, and monitoring GDPR jurisprudence for further constraints on open geospatial data.

Strategic questions require development of value communication frameworks addressing the legibility gap, exploration of EU funding mechanisms through programs like Horizon Europe or Digital Europe for structural support, and high-level policy dialogue among the European Commission, EuroGeographics, EuroSDR, and Member States on long-term NMCA sustainability.

The title of *Feedback's presentations from NMCAs' session* closing presentation captured the workshop's prevailing sentiment: still looking for a sustainable business model. Two years after the Leuven workshop and one year after the HVD deadline, progress was evident in that no NMCAs' existential relevance was questioned, and all had developed adaptation strategies. It is worth noticing that in the opening keynote, the live survey ran among participants revealed a much more optimistic atmosphere than two years before. Yet challenges persisted, with financial sustainability elusive for many and structural problems unresolved. New dimensions including Digital Twins, artificial intelligence, and sovereignty continued expanding the strategic landscape. The heterogeneity of situations precluded one-size-fits-all solutions, with diversity of models and contexts requiring tailored approaches.

Perhaps the most valuable outcome was the community of practice itself. National Mapping and Cadastral Agencies, researchers, and policymakers sharing experiences, learning from successes and failures, and collectively building knowledge about what works, what does not, and what questions require further investigation represented progress even absent definitive answers. The journey continues, with the glass simultaneously half full in relevance secured and political support gained, and half empty in financial sustainability remaining elusive. The next chapter will unfold in coming years as NMCAs continue innovating, adapting, and yes, still searching for fully sustainable business models in the open data era.

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Appendix A: Participating organisation

The Joint EuroSDR and EuroGeographics Workshop on Sustainable Business Models for National Mapping and Cadastral Agencies (NMCAs), Brussels (Belgium) 4th June 2024 was attended by participants from the following organisations:

EuroGeographics

EuroSDR

GEONOTGEO

IGN France

Joint Research Centre (JRC, European Commission)

Kadaster (The Netherlands)

KU Leuven (Belgium)

Lantmäteriet (Sweden)

National Agency of Public Registry (NAPR, Georgia)

National Land Survey of Finland (NLS)

NGI Belgium

University College London (UCL, Great Britain)

Appendix B: Workshop programme

Time	Author	Title
12:00	<i>Registration and Lunch</i>	
	Frédéric Cantat & Eric	
14:00	Bayers	Opening
14:15	Joep Cromptvoets	Keynote Business Models
14:45	Frédéric Cantat	Recap from previous Workshops
15:00	Marjana Zelic	Policy developments update and the initial assessment of the Data Union Strategy and Digital Omnibus EU Regulation Proposal
15:20	Jordi Escriptu	European Policy context and the bounding conditions that would shape the modus operandi of NMCAs
16:00	<i>Coffee break</i>	
16:30	Jack Metcalfe	Digital twins and Business Models: overview across European NMCAs
17:00	Oliwia Marszalek	OME2 Outputs and Data Licensing at EuroGeographics
17:20	Speakers	Panel Discussion and questions from the floor
18:00	End of day 1	
20:00	<i>Dinner</i>	
09:00	Frédéric Cantat	Welcome to day 2 and Summary of Day 1
09:15	Business models in practice – experiences from NMCAs (part 1)	
09:15	Eric Bayers & Jasper Beernaerts	The role of the NGI Belgium in the new Open (geo)data landscape
09:50	Mikael Jenssen & Anna Svedlund	Implementing High Value Data - Legislation, financing and outcome in Sweden
10:15	Bert Beentjes	The impact of data combination and federation on business models
10:35	Jani Kylmäaho & Heli Laaksonen	Improved Collaboration Models: Securing the Sustainable Business Models of NLS Finland
11:00	<i>Coffee break</i>	
11:30	Business models in practice – experiences from NMCAs (part 2)	
11:30	Teimuraz Gabriadze & Glenn Vancauwenberghe	Laying the Ground for a Sustainable Business Model for the Georgian NSDI
11:55	Frédéric Cantat	Still looking for a (sustainable) business model?
12:20	Speakers	Panel Discussion and questions from the floor
13:00	Conclusion and Close of the Workshop	
13:00	<i>Lunch</i>	