TU Delft

Delft University of Technology

Adapting National Mapping & Cadastral Agencies business models to open data supply the survey results

Welle Donker, Frederika; Crompvoets, Joep; van Loenen, Bastiaan

Publication date
2017

Document Version
Final published version

Citation (APA)
Welle Donker, F., Crompvoets, J., & van Loenen, B. (2017). *Adapting National Mapping & Cadastral Agencies business models to open data supply: the survey results*. (Official Publication EuroSDR/European Spatial Data Research; Vol. 67). EuroSDR/European Spatial Data Research. http://www.eurosdr.net/publications/official-publication-no-67

Important note
To cite this publication, please use the final published version (if applicable).
Please check the document version above.

Copyright
Other than for strictly personal use, it is not permitted to download, forward or distribute the text or part of it, without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license such as Creative Commons.

Takedown policy
Please contact us and provide details if you believe this document breaches copyrights.
We will remove access to the work immediately and investigate your claim.

This work is downloaded from Delft University of Technology.
For technical reasons the number of authors shown on this cover page is limited to a maximum of 10.

EuroSDR

European Spatial Data Research

October 2017

Adapting National Mapping & Cadastral Agencies business models to open data supply: the survey results

F.M. Welle Donker, J. Crompvoets and B. van Loenen

Official Publication N° 67

The present publication is the exclusive property of
European Spatial Data Research

All rights of translation and reproduction are reserved on behalf of EuroSDR.
Published by EuroSDR

EUROPEAN SPATIAL DATA RESEARCH

PRESIDENT 2016 – 2018:

Eric Bayers, Belgium

VICE-PRESIDENT 2017 – 2021:

Fabio Remondino, Italy

SECRETARY – GENERAL:

Joep Crompvoets, Belgium

DELEGATES BY MEMBER COUNTRY:

Austria: Michael Franzen, Norbert Pfeifer
Belgium: Eric Bayers
Croatia: Ivan Landek, Željko Bačič
Cyprus: Andreas Sokratous, Georgia Papathoma, Dimitrios Skarlatos
Denmark: Thorben Brigsted Hansen, Tessa Anderson
Finland: Juha Hyyppä, Jurkka Tuokko
France: Bénédicte Bucher, Yannick Boucher
Germany: Hansjörg Kutterer, Lars Bernard
Greece: Vassilios Vescoukis
Ireland: Paul Kane, Audrey Martin
Norway: Jon Arne Trollvik, Ivar Maalen-Johansen
Poland: Piotr Woźniak, Krzysztof Bakuła
Slovenia: Dalibor Radovan, Tomaž Petek, Mojca Kosmatin Fras
Spain: Antonio Arozarena, Javier Barrado Gozalo, Julián Delgado Hernández
Sweden: Tobias Lindholm, Heather Reese, Thomas Lithén
Switzerland: André Streilein-Hurni, Francois Golay
The Netherlands: Jantien Stoter, Martijn Rijsdijk
United Kingdom: Sally Cooper, Jon Mills

ASSOCIATE MEMBER:

ESRI: Nick Land
AIV: Jo Van Valckenborgh

COMMISSION CHAIRPERSONS:

Data Acquisition: Jon Mills, United Kingdom
Modelling and Processing: Jantien Stoter, The Netherlands
Updating and Integration: Jon Arne Trollvik, Norway
Information Usage: Bénédicte Bucher, France
Business Models and Operation: Joep Crompvoets, Belgium
Knowledge transfer: Markéta Potůčková, Czech Republic

OFFICE OF PUBLICATIONS:

Bundesamt für Eich- und Vermessungswesen
Publications Officer: Michael Franzen
Schiffamtsgasse 1-3
1020 Wien
Austria
Tel.: + 43 1 21110 5200
Fax: + 43 1 21110 995202

CONTACT DETAILS:

Web: www.eurosdr.net
President: president@eurosdr.net
Secretary-General: secretary@eurosdr.net
Secretariat: admin@eurosdr.net

EuroSDR Secretariat
Public Governance Institute
KU Leuven
Faculty of Social Sciences
Parkstraat 45 bus 3609
3000 Leuven
Belgium
Tel.: +32 16 37 98 10

The official publications of EuroSDR are peer-reviewed.

F.M. Welle Donker, J. Crompvoets, B. van Loenen:

"Adapting National Mapping & Cadastral Agencies business models to open data supply: the survey results"

Adapting National Mapping & Cadastral Agencies business models to open data supply: the survey results

with 8 figures, 2 tables and 1 appendix

dr. F.M. Welle Donker, dr. J. Crompvoets and dr. B. van Loenen

Business Modelling for Open Data of NMCA Data

Knowledge Centre Open Data –
Department OTB – Research for the Built Environment
Faculty of Architecture and the Built Environment
Delft University of Technology
Julianalaan 134
2628 BA Delft
the Netherlands

Index of Figures

Index of Tables

Abstract

Since 2009, Open Government Data initiatives have been launched worldwide and the concept of open data is gaining momentum. Open data are often associated with realizing ambitions, such as a more transparent and efficient government, solving societal problems and increased economic value. There has been ample literature describing the (potential) benefits of open data. However, to switch to an open data policy may pose a challenge to the business model of National Mapping & Cadastral Agencies (NMCAs), especially if they are required to generate sufficient revenue to cover a substantial part of their operating costs. This research aims to assess the effects of open data policies on the business models of NMCAs and which adaptations have been made to cope with revenue losses due to open data supply. In March and April 2017, we surveyed European NMCAs to find out which strategies NMCAs employ to be able to (re)finance operational costs and to ensure long-term sustainability of (open) data. This report provides the initial outcomes of the survey and will provide an input for a workshop on Sustainable Open Data Business Models for NMCAs, to be held 18-19 September 2017 in Delft, The Netherlands. This workshop will bring together the NMCAs to present and share their experiences of open data and discuss the research results with representatives of academia.

Acknowledgements

We would like to thank all the participants of our survey who supplied us with useful information.

1 INTRODUCTION

1.1 The legal framework for open data

The concept of open data, i.e. data that are available to all without restrictions, originated with the belief that the enormous amount of information collected by government organisations as part of their public tasks, should be available to all citizens. The open data initiatives gained momentum when in 2009, President Obama issued a memorandum on transparency and open data, which declared that "openness will strengthen our democracy and promote efficiency and effectiveness in government".[1] In 2010, the European Commission followed suit by publishing the Digital Agenda for Europe as one of the seven pillars of the Europe 2020 Strategy, which sets objectives for the growth of the European Union by 2020.[2] Data may be considered to be open data if the dataset complies with a number of open data principles related to technical, financial, legal and organizational

[1] Obama, B. (2009). Transparency and Open Government. Memorandum for the Heads of Executive Departments and Agencies. Washington, The White House https://www.whitehouse.gov/the_press_office/TransparencyandOpenGovernment, Accessed March 29, 2016, p.1

[2] European Commission (2010). Communication from the Commission of 19 May 2010 to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – A Digital Agenda for Europe [COM(2010) 245 final]. COM(2010) 245 final/2 http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=URISERV%3Asi0016, https://ec.europa.eu/digital-single-market/en/europe-2020-strategy, Accessed March 29, 2016

aspects.[3] In this report, we consider open data to be all data that are available for re-use without financial, legal or technical restrictions.

1.1.1 Re-use of public sector information

The European Commission views opening public data as a way to realise the full potential for re-use in new products and services and for efficiency gains in administrations.[4] To facilitate the re-use of public sector information, the so-called PSI Directive 2003/98/EC was replaced by the 2013/37/EU Amended PSI Re-use Directive.[5] The Amended PSI Re-use Directive encourages implementation of open data policies. However, the Amended PSI Re-use Directive merely sets recommendations for publishing documents as primary data, the use of open and machine-readable formats, and open licences. The 2013 Amended PSI Re-use Directive promotes the use of open licences available online (recital 26) but does not mandate the use of open licences. In the Implementation Guidelines, the European Commission recommends the use of Creative Commons licences.[6]

The 2013 Amended PSI Re-use Directive applies the principle that where charges are made by public sector bodies for the re-use of data, those charges should in principle be limited to the marginal costs of disseminating the data. However, the 2013 Amended PSI Re-use Directive recognised that a number of public sector bodies that are required to generate revenue to cover a substantial part of their operational costs (so-called self-funding agencies) would be hindered if they could not charge fees for the re-use of their data. In such cases, public sector bodies should be able to charge above marginal costs. Those charges should be limited at a ceiling calculated on the basis of actual costs. Recital 22 states that charges set according to objective, transparent and verifiable criteria and the total income from supplying and allowing re-use of documents should not exceed the cost of collection, production, reproduction and dissemination, together with a reasonable return on investment.

1.1.2 Sharing of geographical information

The so-called INSPIRE Directive[7] was adopted in 2007 to facilitate the sharing of public sector geographical information. The INSPIRE Directive provides a framework of general rules, implementing rules and measures aimed at the establishment of a geographical information infrastructure to facilitate policy-making and measures that may have an impact

[3] For a description of these open data principles, see e.g. Welle Donker, F. (2016). *From Access to Re-use: a user's perspective on public sector information availability.* Ph.D. Dissertation, Delft University of Technology, Delft.

[4] European Commission (2011). Open Data: An engine for innovation, growth and transparent governance. Brussels. COM(2011) 882 final: 13, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0882:FIN:EN:PDF, accessed June 10, 2013.

[5] 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.

[6] European Commission (2014). Guidelines on recommended standard licences, datasets and charging for the reuse of documents (2014/C 240/01). Brussels (Official Journal of the European Union). 57: 10, http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.C_.2014.240.01.0001.01.ENG&toc=OJ:C:2014:240:TOC, accessed September 11, 2015.

[7] 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).

on the environment. The framework addresses accessibility and exchange of geographical data across various levels of public authority and across different sectors through harmonisation and standardisation. The INSPIRE Directive requires that INSPIRE datasets[8] are described through metadata, have interoperable formats and are accessible through network services with minimum performance criteria for those services. These criteria relate to performance, capacity and availability of network services. INSPIRE requires that public access to discovery and viewing services are without costs but download services may be subject to licences and charges.

1.1.3 Open government data initiatives

In July 2013, G8 leaders signed the G8 Open Data Charter. The G8 leaders agreed that open data are an untapped resource with a huge potential to encourage the building of stronger, more interconnected societies that better meet the needs of our citizens and allow innovation and prosperity to flourish (recital 7). Recital 2 of the G8 Open Data Charter states that access to data allows individuals and organisations to develop new insights and innovations that can improve the lives of others and help to improve the flow of information within and between countries. While governments and businesses collect a wide range of data, they do not always share these data in ways that are easily discoverable, useable, or understandable by the public.[9] The G8 Open Data Charter sets out five core open data principles, of which the first principle establishes open data by default, i.e. an expectation that all government data be published openly by default, while recognising that there are legitimate reasons why some data cannot be released. G8 members have also identified 14 high-value areas – from education to transport, and from health to crime and justice – from which they will release data. One of the 14 identified high value areas is geospatial data, such as topography, postcodes, national and local maps.

1.2 This research

Since 2009, Open Government Data initiatives have been launched worldwide and the concept of open data is gaining momentum. Open data are often associated with realizing ambitions, such as a more transparent and efficient government, solving societal problems and increased economic value. There has been ample literature describing the (potential) benefits of open data. However, to switch to an open data policy may pose a challenge to the business model of National Mapping & Cadastral Agencies (NMCAs), especially if they are required to generate sufficient revenue to cover a substantial part of their operating costs. To generate revenue, NMCAs may adopt a number of instruments. NMCAs may be able to generate revenue by levying taxes for a specific purpose, or by compulsory registration fees, e.g. for cadastral transactions. In addition, many NMCAs receive revenue from licence fees for their fee-based datasets, and/or for providing additional services, such as providing tools or hosting a data platform on behalf of other government organisations.

---

[8] The INSPIRE Directive applies to 34 content themes, ranging from specific geographic reference data themes (e.g., transport networks, cadastral parcels, buildings, ortho-imagery, elevation, statistical and administrative units) to environmental themes (e.g., geology, habitats and biotopes, human health and safety, meteorology, hydrology, oceanographic features). Thus, the INSPIRE Directive applies to many of the datasets managed by NMCAs.

[9] G8 Open Data Charter and Technical Annex (2013), https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/207772/Open_Data_Charter.pdf, p.1-2

A shift from licenced data supply to open data supply often means a loss of revenue in the short term. The lost revenue due to open data may pose a risk to data update frequencies and data quality. However, open data may also offer benefits to the organisation, for example, data quality may increase because citizens and companies can provide direct feedback. There may be efficiency gains due to the fact that data-providers no longer require maintaining a sales office. In addition, other public bodies no longer have to pay to use public sector datasets. Thus, the transaction costs for both the data provider and the users decrease due to open data. However, it is by no means a certainty that the (indirect) benefits of open data outweigh the direct costs of the data supplier. Moreover, to supply open data is one thing, to ensure sustainable open data from financial (sufficient funds in the future), technical aspect (availability in the long term) and organisational (sufficient human resources) aspects is quite another thing.

EuroSDR, in cooperation with Eurogeographics, commenced this research to assess the effects of open data policies on the business model of National Mapping Agencies and to open a debate about the future business models in the context of open data. This includes direct effects on the way the organisations are able to (re)finance their operational costs and to ensure long-term sustainability of their (open) data. In addition, we would like to assess the future of open data within their organisation and within their country.

2 QUESTIONNAIRE OF APRIL 2017 SET-UP AND RESPONSES

To be able to assess the effects of open data on the business model of National Mapping and Cadastral, a survey was held in the spring of 2017. The results of the survey will be the input of a Workshop to be held on 18th and 19th September 2017 at Delft University of Technology in the Netherlands.

2.1 Questionnaire set-up

An online questionnaire was available from 1st March 2017 until 30th April 2017. The questionnaire consisted of 17 questions divided into five parts. The first part of four open questions established from which organisation and which country the NMCA originated, and the name plus position of the person who completed the questionnaire.

The second part of the questionnaire consisted of three multiple-choice and one open question to provide background information on the funding model of the NMCA. We asked since which year the NMCA supplies open data, and which datasets are the most popular open datasets. In addition, we asked what the breakdown is of how the NMCA is funded before and after the introduction of open data to establish the effects the supply of open data has had on the funding model of the NMCA. We also asked in which way the NMCA funds open data.

The third part of the questionnaire of two multiple-choice questions related to legal, technical and organisational interoperability of open data. We asked if the NMCA followed their national open data policy or if the NMCA had formulated an open data policy specifically suited to their position as a self-funding agency and if the NMCA used a

Creative Commons licence or declaration as recommended by the European Commission's Implementation Guidelines of 2014, or a customised open data licence. We also asked which measures the NMCA had taken to ensure the (long-term) sustainability of open data, such as publishing (meta)data in open standards, and which measures are taken to assist employees and to facilitate re-users. The last question of this part provided a list of reasons for open data publication and what the expectations are for open data. The NMCAs could use a Likert scale to rate the statements from (1) not important at all to (5) very important.

The fourth part of the questionnaire consisted of two multiple-choice questions related to an assessment of the maturity of open data within the organisation and which effects open data has had on the organisation.

The final part of the questionnaire consisted of four open questions, in which we asked the NMCA for a vision on the future of open data within the organisation and within the country, and which success factors will contribute the most to a sustainable open data ecosystem.

The only question that was compulsory was the first question ('What is the name of your organisation'); the other questions were optional. The multiple-choice questions often included a free field ('other, namely') to allow respondents room to explain their specific case. Although we asked for the name of the respondent's organisation, the questionnaire statistics are anonymous. Only the time and date were recorded of online forms that were started, were recorded. On average, the survey took ca. 32 minutes to complete. Appendix 1 shows the pdf version of the questionnaire.

2.2 Questionnaire target group

As the target group of this questionnaire was European National Mapping and Cadastral Agencies, an e-mail containing an invitation and the link to the online questionnaire was sent to all EuroSDR members. On several occasions, a reminder was sent to the EuroSDR members. On request of two EuroSDR members, a pdf version of the questionnaire was forwarded.

2.3 Questionnaire response

During the survey period, the link was also distributed among other networks, e.g. the Global Spatial Data Infrastructure (GSDI) Association's network. As a consequence, the survey contained responses from organisations other than NMCAs and from outside Europe. In total, 577 persons received the link to the questionnaire, of which 96 (17%) started the survey and 36 (6% of total no. of approached and 37.5% of all who had started) actually completed the survey. 17 of the 43 completed questionnaires were returned by 15 members of EuroSDR: 11 National Mapping & Cadastral Agencies, two State / Local Mapping & Cadastral Agencies (LMCAs), one national clearinghouse and one pan-European clearinghouse (both based in Belgium), and one university. Two EuroSDR NMCAs had completed the survey twice: in one case by two different persons from different divisions, in the other case the same person had completed two almost identical forms.

The other 26 forms were returned by two Cadastral Agencies, eight NMCAs, four LMCAs (three State MCAs and one municipality), two public sector agencies that supply open data, five universities, three private companies, one NGO, and one anonymous organisation. One of the NMCAs returned the questionnaire twice: once for the Mapping department and once for the Cadastre department. Table 1 shows the summary of all responses.

Table 1: Summary of EuroSDR questionnaire responses

Country	Type of Organisation						EuroSDR member
	NMCA	LMCA	Clearing House	Public sector body	Academia	Company	
Belgium			2			1	yes
Bolivia	1						no
Canada						1	no
Columbia					1		no
Croatia	2 x*						yes
Cyprus					1		yes
Czech republic	2 x†						no
Estonia	1						no
Finland	1						yes
France	1						yes
Germany	1	3			1		yes
Ghana						1	no
Global				1‡			no
Hungary	1						no
Ireland				2			no
Italy					2		no
Lithuania	1						no
Netherlands	1	1					yes
Niger					1		no
Portugal	1						no
Romania	1						no
Slovakia	1						no
Slovenia	2 x†						yes
Spain	1	2					yes
Sweden	1						yes
Switzerland	1						yes
UK - England & Wales	1						yes
UK - Northern Ireland	1						no
USA	1						no
Total	**23**	**6**	**2**	**3**	**6**	**3**	

* returned twice by the same contact person. Only the second response was included in the analysis as the two responses were almost identical

† returned by two different divisions and by two different persons of the NMCA. Both responses included in the analysis

‡ this organisation is actually an NGO.

3 SURVEY ANALYSIS

3.1 Inclusion criteria

For this report, we only considered completed forms of all European-based Mapping and Cadastral Agencies, the clearing houses and the public sector bodies supplying mapping information. We included two Cadastral agencies, six State / Local Mapping & Cadastral agencies, 17 forms of 15 National Mapping & Cadastral agencies, the national geodata clearing house and the pan-European geodata clearing house as these organisation serve as a one-stop shop of National Mapping & Cadastral Agencies data, and two public sector bodies, a total of 29 forms of 27 organisations. We excluded one of the double entries of the NMCAs that had filled in the survey twice as the answers were almost identical, except for breakdown of funding. We included the form which we received last. We excluded the public sector bodies supplying open data as these organisations do not supply mapping and/or cadastral datasets

3.2 Results of the survey: effects of open data on the organisation

In this section we describe the outcomes of the survey.

3.2.1 Year in which open data supply was implemented

Eight of the organisations indicated that they started to supply open data before 2010, i.e. before the European Commission published their Digital Agenda for Europe in 2010. Two NMCAs and one LMCA indicated that they do not supply open data at all, and one NMCA had left this option blank. The two NMCAs that had returned two forms both submitted different years in the two forms. Figure 1 shows the year the MCA introduced open data supply.

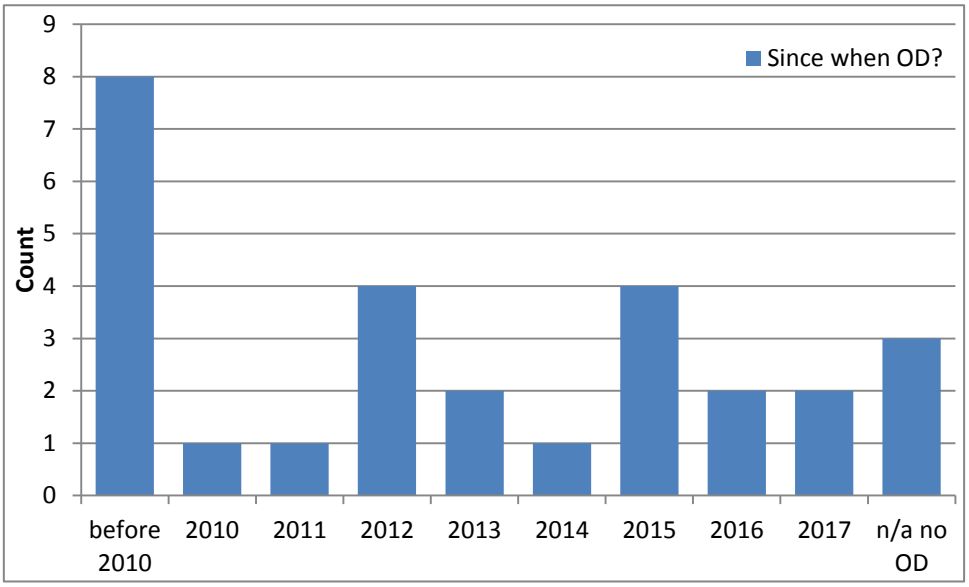

Figure 1: Year of open data supply

3.2.2 Funding before and after implementation of open data

The participants were asked to provide an indication of the breakdown in percentages of the way in which their organisation is funded before and after the introduction of open data. 23 organisations replied this question in 25 forms. Four LMCAs had left this question blank.

Eight organisations indicated that before open data, central government funded 100% of their operational costs, and nine were 100% funded after the implementation of open data. One organisation indicated that 98% of their funding came from the central government before open data, and this had increased to 100% funding after open data. The other organisations received between 30% and 90% of their funding from the central government before open data. After the implementation of open data, for most organisations this percentage remained more or less stable. Only one organisation indicated that before open data, it received no funding from the central government, and after open data this percentage had changed to 100%.[10] Other source of income before open data were specific taxes (one organisation 10%), registration fees (four organisations, accounting for 6% to 100%), fee-based data (nine organisations, accounting for 2% to 50%), (tailor-made) fee-based services (8 organisations, accounting for 6% to 60%), and other income sources (three organisations, accounting for 4% to 15%). Other income sources named were: "participation in (inter)national projects" (twice named) and "commercial activities" (once named). The percentages of the latter sources of income remained stable or increased after the introduction of open data. One NMCA indicated that after the introduction of open data, they generate income from sales to consumers (6%). Table 2 shows the overview of the funding models of the organisations.

[10] Although this outcome may be affected by the way the question was interpreted by the NMCA in question, probably how open data are funded by the NMCA rather than the total operational costs. Earlier research showed that this particular NMCA generates a large percentage of their income through register transaction fees and only receives compensation from the national government for 50% of lost revenue due to open data, see, Welle Donker, F. and B. van Loenen (2016). Sustainable Business Models for Public Sector Open Data Providers. JeDEM Journal of eDemocracy & Open Government **8**(1): 28-61

Table 2: Funding model of the organisations before and after the introduction of open data, in percentages

Freq. of responses	Central government funding (general revenue)		specific taxes		Registration / transaction fees		fee-based data supply		Fee-based services, (tailor-made products, consultancy)		other		namely
	pre OD	post OD	pre OD	post OD	pre OD	post OD	pre OD	post OD	pre OD	post OD	pre OD	post OD	
8	100	100											
1	98	100					2	0					
1	90	100											
1	90	90	10	10					10	0			
1	90	90			10	10							
1	85	85									15	15	Commercial activities
1	82	0			6	0	6	0	6	0			
1	76	76					4	4	15	15	5	5	International programs
1	70	0					15	0	15	0			
1	66	58					10	6	20	24	4	12	(inter)national projects participation
1	60	60					40	40					
1	50	60					40	20	10	20			
1	30	30					10	10	60	60			
1	30	30			20	20	50	50					
1	0	100			100	0							
1	0	5			0	50	0	45					
1									30	30	70	70	membership fees
1	0	56					0	37			0	7	consumer sales

3.2.3 Most popular open datasets

The organisations were asked to list their five most popular open datasets in order of popularity. Although this list showed quite some diversity in both the types of data and in

nomenclature, in general, the datasets that were named more than once were: 'parcels, building & administrative units and/or boundaries' (13 times), 'topographic data' (ranging from 1:5,000 to 1:1,000,000) (11 times), 'address data' (6 times), 'ortho-photos' (6 times), 'real estate (prices paid and/or no. transaction) data' (5 times), 'cadastral data' (3 times), 'cadastral maps' (3 times), 'digital elevation data' (2 times), and 'national reference data' (2 times). Some organisations named the same dataset more than once as the datasets are supplied in open format and in proprietary format(s), different scales and/or via different services.

3.2.4 Funding of open data activities

The organisations were asked to indicate in which way they finance open data activities and were allowed to select more than one option. 27 Organisations answered this question in 29 forms. Most organisations only selected one option, two NMCAs selected two options and two NMCAs selected three options. Twelve of the 27 organisations receive (extra) compensation from the national government. Open data activities are further financed from other forms of revenue, such as the sale of other data products. Internal efficiencies were selected by about a quarter of the organisations. In the category "other", organisations mentioned 'commercial / international projects' (twice), 'extra compensation from public agencies / local authorities', 'sale of large-scale data when only small scale data are supplied as open data', '(subsidised by) sale of other data products' (twice) 'budget of State government', or 'no extra financing required' (three times). Figure 3 shows the breakdown of open data activities funding.

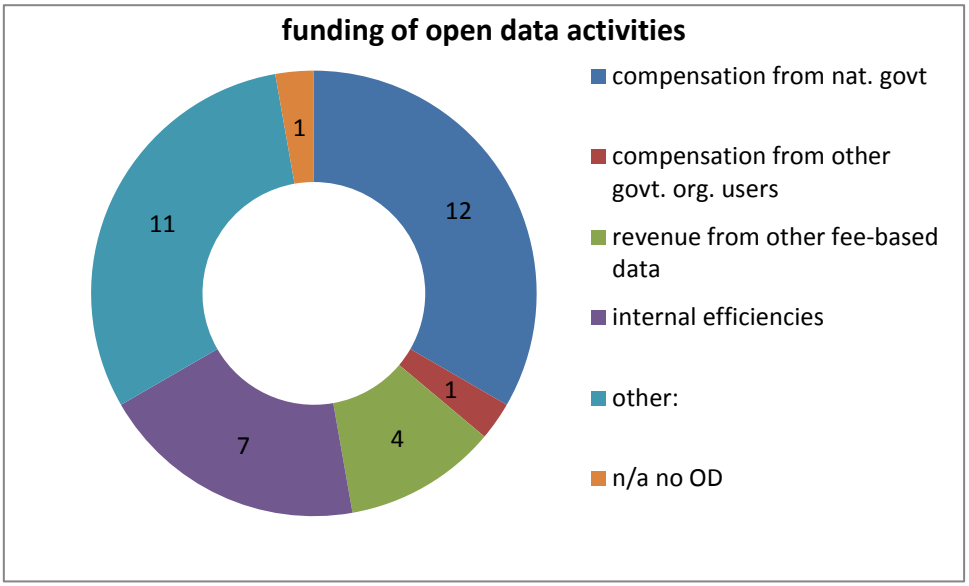

Figure 2: funding of open data activities

3.2.5 Formal embedding of open data policies and licences

We asked the organisations to list in which way they have formally embedded open data policies within the organisation. Respondents could select more than one option. We had

provided the option "exempt from national open data policy" due to the fact that many NMCAs are self-funding agencies and the 2013 PSI Re-use Directive leaves room for self-funding agencies to charge fees for their data.[11] However, none of the respondents selected this option.

17 National and Local Mapping & Cadastral Agencies and one clearing house answered this question. Three NMCAs indicated that they partially follow the open data policy formulated on national level. When asked to specify which adaptations were made to the national open data policy, all three MCAs indicated that the differences were due to the self-funding nature of the organisation. Of the five NMCAs that had selected the option "We formulated our organisation's open data policy to suit our specific requirements", only one NMCA indicated this was due to the self-funding requirements of their organisation. Three NMCAs used this option to refer to their motivation for an open data policy, and one NMCA used this option to refer to the name of the specific open data policy. One NMCA had marked two options: "partially follow national OD policy" and "we have specified our own OD policy". Figure 3 shows the distribution of organisations following national open data policies.

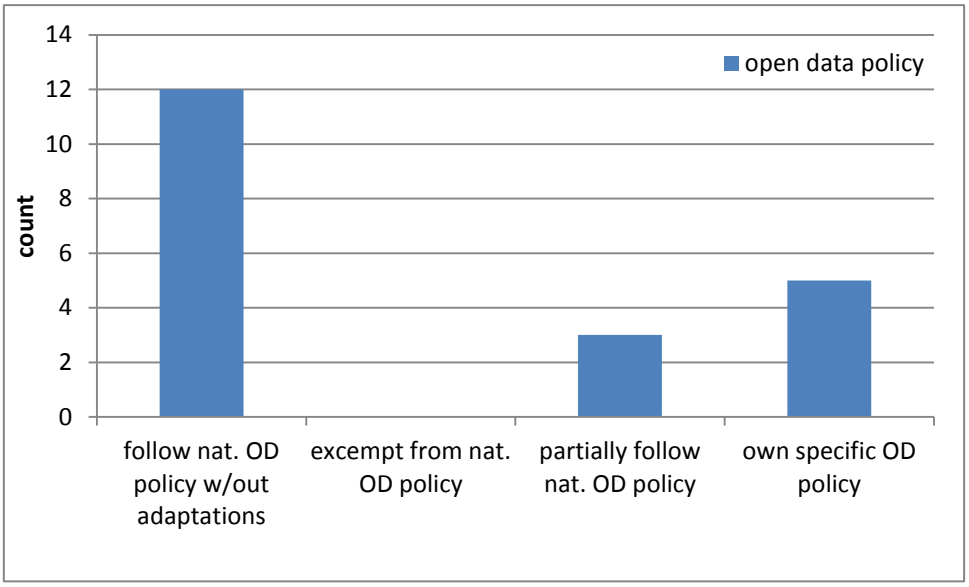

Figure 3: Adherence to national open data policy

In addition, we asked which open data licence(s) (if applicable) were used to supply open data. The respondents could select more than one option. With this question, we wanted to

[11] See Recital 22 of 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. European Union, Official Journal of the European Union. **L 175:** 1-8

assess which organisations adhere to the recommendations made by the European Commission to use Creative Commons licences for the supply of open government data.[12]

When asked if the organisation uses Creative Commons (CC) licence or declarations to supply open data, seven indicated they used CC-BY licences (licences that require the user to attribute the source data holder). The CC-BY licences named, ranged from no version named (twice), CC-BY 2.5 (once), CC-BY 3.0 (once) and CC-BY 4.0 (three times). Nine organisations have formulated their specific open data licence, with most open data licences building on CC-BY licences. One organisation had selected the option of a CC-licence as well as own OD-licence. Twelve organisations did not supply an answer to this question. Figure 4 shows the types of open data licences in use by NMCAs and LMCAs.

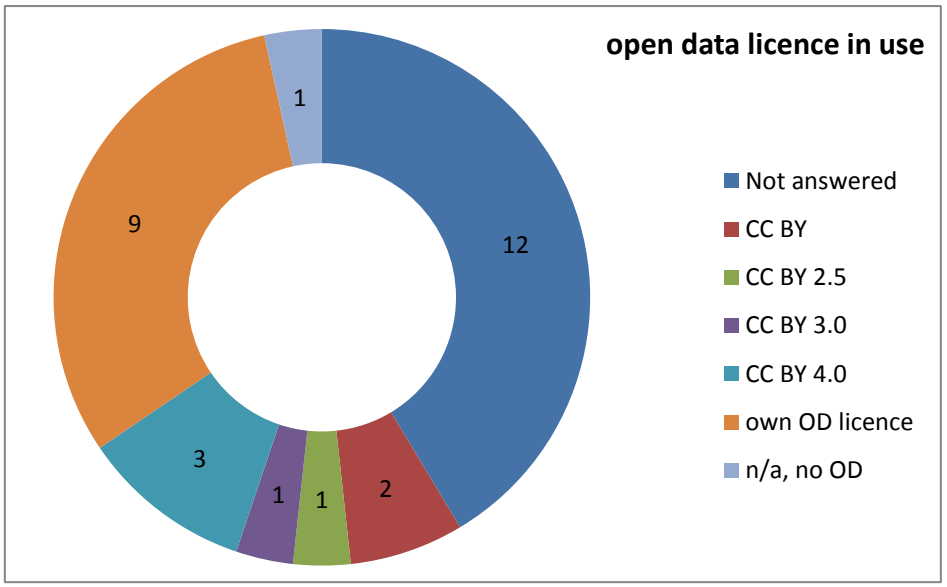

Figure 4: open data licences in use by NMCAs and LMCAs

3.2.6 Measures taken to ensure sustainable open data

In this questionnaire we considered sustainability from a technical perspective, i.e. supply of open data and metadata in open data standards, and if tools / platforms were supplied to facilitate users. We also asked if MCAs provide open data as linked open data. In addition, we considered sustainability from a financial perspective, i.e. if sufficient financial and human resources were (re)allocation to ensure open data supply in the long term. We considered sustainability from an organisational perspective, i.e. has the organisation appointed special data officers / data stewards to assist employees with the implementation of open data and to champion the cause of open data. Finally, we asked if the organisations participated in platforms / forums with other open data suppliers and with open data users. The organisations could select more than one option.

[12] European Commission (2014). Guidelines on recommended standard licences, datasets and charging for the reuse of documents (2014/C 240/01). Brussels, Official Journal of the European Union. **C 240:** 1-10

Almost all organisations have taken multiple measures to ensure that open data will be available in a sustainable way. Most organisations selected more than one option, with an average of 3.6 options selected. Two LMCAs that supply open data had not selected a single option. Five organisations indicated they took other measures. The measures named were 'participation in hackathons', 'participation in innovation programmes', 'INSPIRE requirements', and 'follow national guidelines" (twice). Figure 5 shows the frequency of measures taken to ensure sustainable open data.

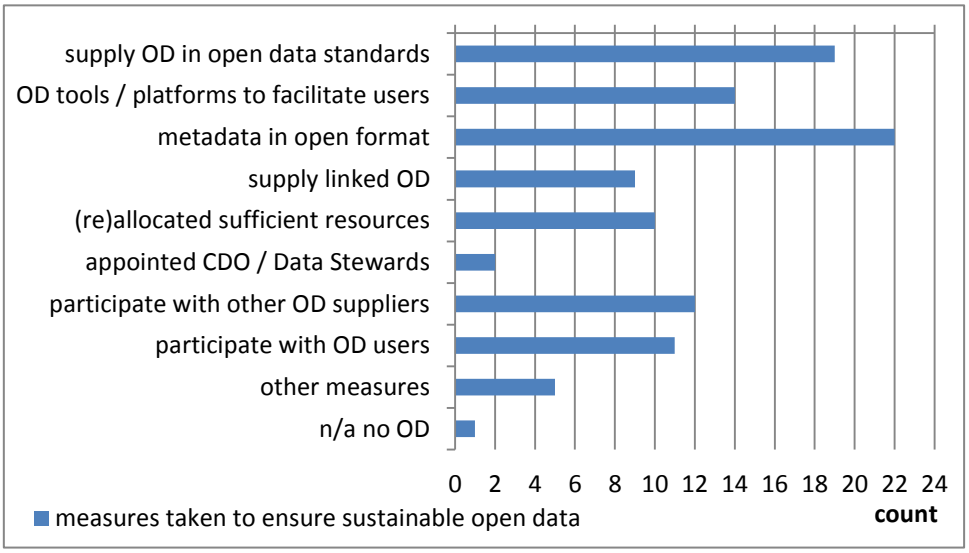

Figure 5: measures taken to ensure sustainable open data

3.2.7 Motivations for implementing open data within the organisation

This question allowed the MCAs to select and rate motivations for implementation of open data on a Likert scale of 1 to 5. A '1' reflected that the motivation was considered "not important at all" and a '5' indicated that the motivation was considered "very important".

The most important drivers for supplying open data appear to be legal requirements, lower transaction costs, higher data quality due to more feedback, economic growth due to more value added products and services developed by the private sector, and higher societal benefits. There appears to be no correlation between the different motivations and the country of the organisation. For instance, the motivation that open data will lead to more transparency, accountability and lower corruption does not appear to be more important in Eastern European countries. In the category "other", open data was seen to make a positive contribution to education and research (once) or open data was published as promotion of other data products and services (once). Figure 6 shows the motivations for supplying open data, and the importance of these motivations for the organisation.

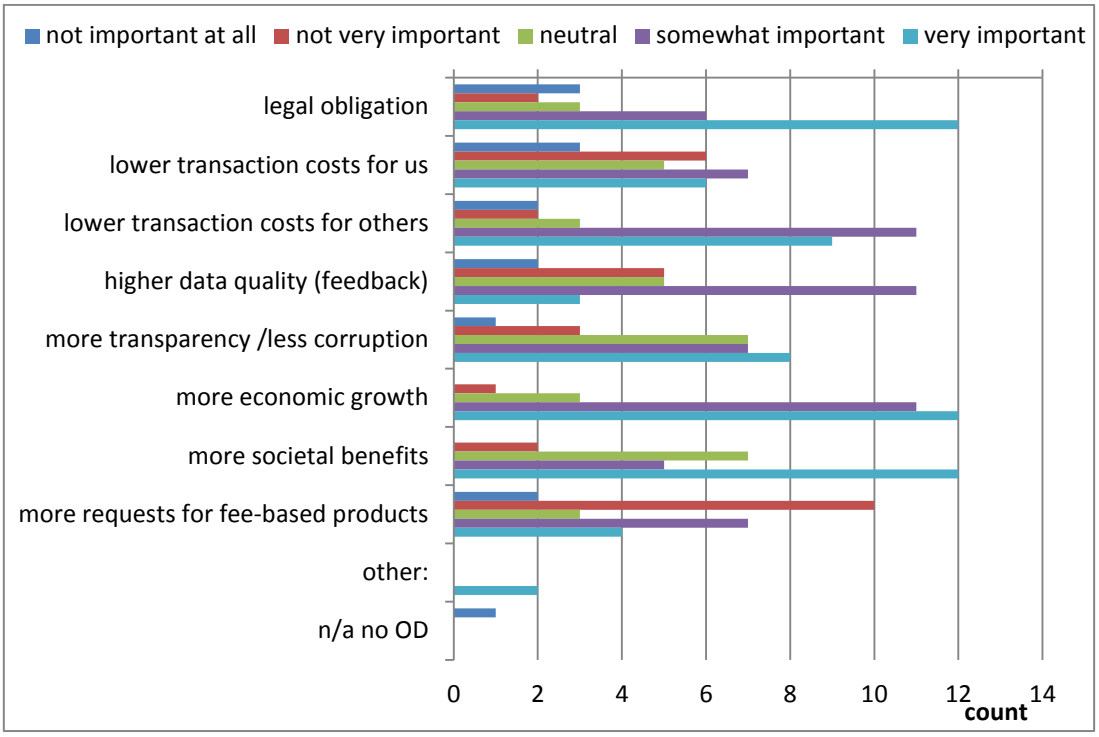

Figure 6: motivations for open data with ranking of importance to organisation

3.2.8 Open data maturity within the organisation

In this question, we asked how organisations would assess the level of maturity for open data within their organisation. The organisation could select which phase they consider to be in, ranging from 'pilot phase' to 'institutionalised and considered to be a leader / role model for other open data suppliers'. Organisations could only select one option.

The three organisations that selected the option “other, namely” indicated that some (small scale) geodata were published as open data to comply with legal requirements. Supply of such open data was institutionalised within the organization. One NMCA indicated that publishing some datasets as open data was used in conjunction with an application to the central government for compensation to publish more open data. This field was used by a number of NMCAs to express their concern about funding for more open data. Figure 7 shows the level of maturity of open data within the organisation.

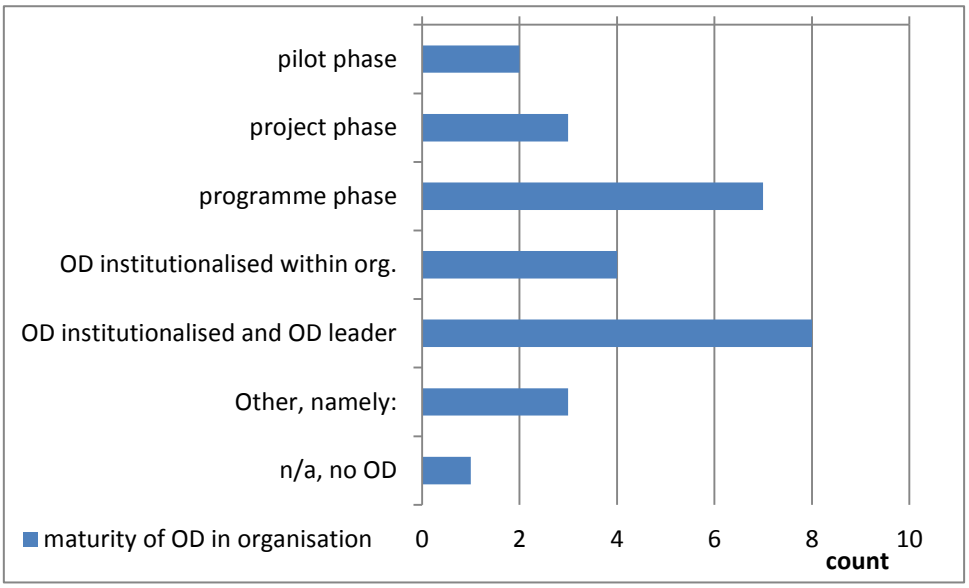

Figure 7: level of open data maturity of the organisation

3.2.9 Effects of open data for the organisation

The last of the multiple choice questions related to the effects of open data on the organisation. Organisations could select more than one option. Previous research by various institutes showed that organisations experience a number of effects when switching from fee-based data to open data.[13] Examples of such direct effects are extra infrastructure investments, e.g. extra security measures and/or server capacity to host open data separately from the fee-based data. Other effects may be that the organisation receives more questions related to technical aspects of the data and feedback / error reports by users.[14] Not all users are equally capable to use the data when provided in (open) geo standards and not all metadata is clear to the users.[15] Open data may also lead to more requests for other (non-open) datasets (as fee-based services) or for tailor-made products as re-users see the potential of open data and prefer a higher service level for the same dataset. In addition, other public sector organisations may ask for advice on open data implementation.

With this question, we wanted to verify earlier desk research by the authors, which indicated that the supply of open data by self-funding agencies will not necessarily lead to losses in

[13] See e.g. Ubaldi, B. (2013). Open Government Data, OECD Publishing**:** 61. http://dx.doi.org/10.1787/5k46bj4f03s7-en, and Omidyar Network (2014). Open for Business: How open data can help achieve the G20 growth target**:** 84. https://www.omidyar.com/sites/default/files/file_archive/insights/ON%20Report_061114_FNL.pdf

[14] See e.g. Lind, M. (2014). Addresses and Address Data. Socio-economic benefits of Open Address Data experiences in Denmark. State of the Map France. Paris, OpenStreetMap France (OSM-FR) http://www.slideshare.net/slideshow/embed_code/33158858

[15] Cf. Welle Donker, F., & van Loenen, B. (2016). How to assess the success of the open data ecosystem? *International Journal of Digital Earth*, 1-23. http://dx.doi.org/10.1080/17538947.2016.1224938

revenue in the long term. Where the researched self-funding organisations supply open data in addition to fee-based services, there have been no negative effects on the fee-based services. It should be stressed though, that in the researched organisations, revenue generated by fee-based data services are relatively low when compared to the main source of income (central government funding and/or legal instruments, such as registration fees or specific taxes) and revenue from fee-based services is independent from the main source of revenue. In a number of cases, revenue from fee-based services has even increased as users recognised the added value of fee-based data over open data. Open data has led to internal efficiency gains, although in practice, it is difficult to quantify internal efficiency gains solely due to open data in isolation as the researched organisations continuously implement measures to increase efficiency.[16]

This question was answered by 23 organisations. The organisations were allowed to select more than one option. The responses showed open data has had effects on the organisation. Just over half of the organisations had to employ extra server capacity to cope with the increased data traffic. Just over half of the organisations also receive more questions from users related to technical aspects of the data. In addition, open data has led to more requests for other open datasets, and to more feedback / error reporting. For nearly half of the organisations has open data also led to requests for advice on open data implementation from other organisations. Although for nearly a third of the organisations open data has led to decreased revenue from fee-based data, in one case, open data has also lead to more requests for tailor-made products and has revenue of fee-based services increased. In the category 'other', organisations named effects, such as "increased data traffic", "less information about who is using the data and what for", "contact with new types of users", and "seen to be a partner in data rather than a supplier of data". Figure 8 shows the effects of open data experienced by the organisations.

[16] Welle Donker, F., & van Loenen, B. (2016). Sustainable Business Models for Public Sector Open Data Providers *JeDEM Journal of eDemocracy & Open Government, 8*(1), 28-61.

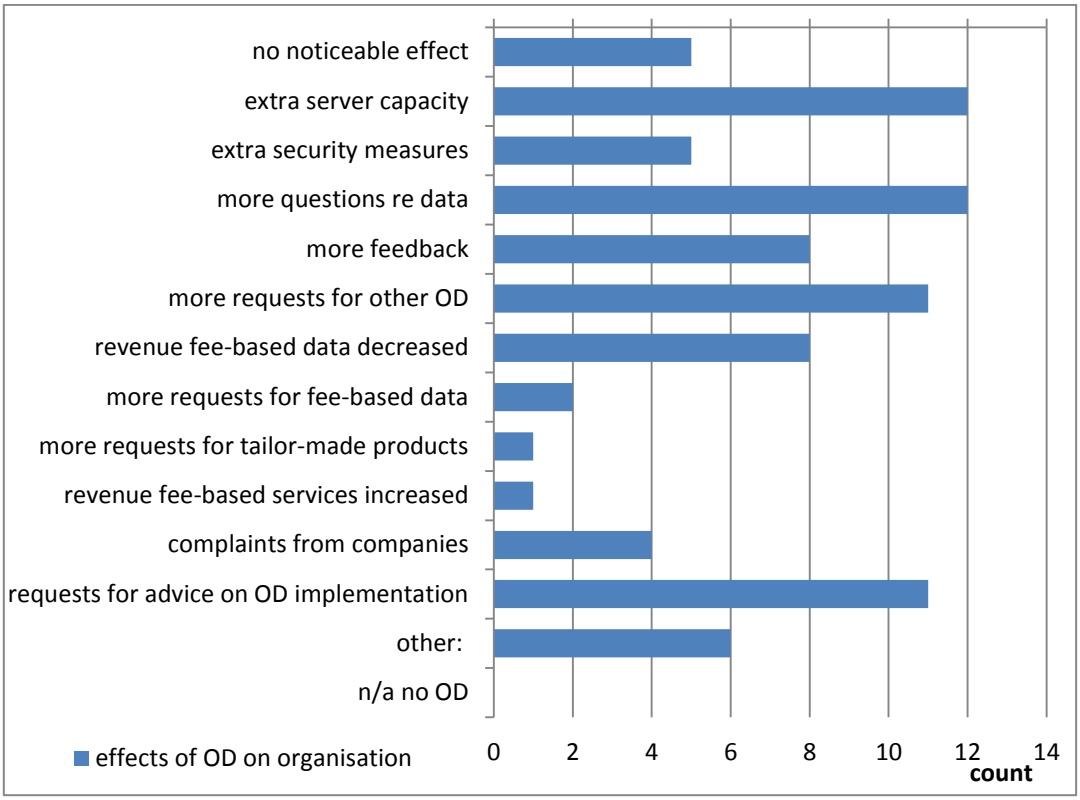

Figure 8: Effects of open data on the organisation

3.2.10 Future vision for open data

The last section of the questionnaire consisted of three open questions related to the respondent's vision on the future of open data, both within their organisation and within their country. In addition, we asked which success factor will in their opinion contribute the most to a sustainable open data environment.

3.2.10.1 Vision on the future of open data within the organisation

Most organisations indicated that open data policies are not likely to be reversed in the near future. Most organisations are in the process of releasing more data as open data, sometimes driven by legislation but more often driven by the notion that open data will serve the greater good. Open geo-information is viewed as an essential component to address environmental issues. Some organisations indicate that current national legislation may impede the publication of their data as open data, although the specific barriers are not specified. A number of organisations expressed their concern about open data funding: without some form of compensation to offset the extra infrastructural costs and extra transformation costs to publish data as open data, and to offset losses in revenue, it will be difficult to publish high-value open data. Some self-funding NMCAs have apparently managed to secure such extra funding and expect to make more – if not all – data available as open data in the near future.

3.2.10.2 Vision on the future of open data with the country

Again, a number of organisations used this question to stress the need for (co-)funding open data. One organisation suggested that the private sector – the largest beneficiaries of open data – should make a contribution to the open data ecosystem, either financially or by donating their data as open data.

A number of organisations raised the need for harmonisation and standardisation, especially for reference data. This will be essential to ensure that when decentralised governments, such as municipalities, become part of the open data ecosystem the data will retain their status as authoritative data. If the mapping agencies cannot achieve consensus on a common policy, then they will lose the battle with other mapping platforms, such as OpenStreetMap. The NMCAs view geodata to be leading the standardisation process in the open data ecosystem and other types of data, such as statistical data, should follow the lead of geodata.

3.2.11 Success factors that will contribute to sustainable open data

Not surprisingly, again sustainable funding was mentioned most often as the success factor contributing most to a sustainable open data ecosystem. Coming into second place, were common standards and improved metadata models and metadata documentation processes. A reduction of complexity was named by three organisations, to be achieved through simple(r) licences and better collaboration between data providers. Two organisations named pro-active promotion and facilitation of open data, e.g. hackathons and competitions, and close contact with the re-users as essential success factors. Some of the East-European organisations expressed uncertainty about the political will in the long term as a potential threat to the establishment of a successful open data ecosystem. Two organisations stressed the need for a good balance between data costs and data quality as not all re-users of open data require a high level of quality. Being able to show positive business cases will help to strengthen the political will to contribute to a sustainable open data ecosystem, both from a policy-making aspect as from a financial aspect. Although there are examples of societal benefits, such as improved navigation systems, business cases to demonstrate the economic value of open data are needed to maintain the political will.

4 PRELIMINARY CONCLUSIONS AND FURTHER STEPS

The outcomes of this survey appear to confirm the finding of earlier case study research into the effects of open data on the business model of National and State Mapping and Cadastral Agencies.[17] However, the sample is probably too small for a statistical analysis to calculate correlations between different aspects, e.g. the implementation year of open data and the (longer) term effects of open data. The number of respondents was sufficient to carry out a qualitative assessment.

About a third of the National Mapping & Cadastral Agencies (NMCAs) started to supply open data before the introduction of the Digital Agenda for Europe of 2010. This appears to indicate that the move towards open data predates the Digital Agenda. As the INSPIRE

[17] Welle Donker, F. and B. van Loenen (2016). "Sustainable Business Models for Public Sector Open Data Providers " JeDEM Journal of eDemocracy & Open Government **8**(1): 28-61.

Framework Directive was named several times, INSPIRE seems to have had a distinct influence on supplying at least some datasets as open data. The datasets listed as the most popular open data sets are all part of the 34 content themes identified in INSPIRE. Although the INSPIRE Framework Directive also provides data specifications and standards, the NMCAs expressed a need for simple standards which are more applicable to current technological developments.

Nearly all NMCAs receive some funding from the central government to cover their operational costs, ranging from 5% to 100%. About half of the NMCAs receive some extra compensation after the release of open data. Open data supply does not appear to have had a significant effect on the break-down of funding: most NMCAs that depend on other forms of income, such as registration fees or fee-based data, continue to do so to the same extent as after the release of open data. Open data activities are further financed from other forms of revenue, such as the sale of other data products, or by internal efficiencies. Many of the NMCAs express a desire to receive some or more compensation from the central government for supplying open data. However, it appears that the NMCAs manage to fund their open data activities to date.

In spite of the recommendations made by the European Commission to use Creative Commons licences for the supply of open government data,[18] less than a quarter of the surveyed NMCAs appear to do, with about a third of the organisations opting for their own open data licence. Although such licences are in most cases inspired by Creative Commons licences, they may not always be interchangeable. This may pose a legal barrier for users of pan-European data sourced from the individual NMCAs.[19] As only just over half of the surveyed organisations answered this question, the sample is too small to draw any conclusions. However, the variety of open data licences in use remains an issue that needs attention

For a successful open data ecosystem, the key factors appear to be guaranteed funding, cooperation between data suppliers and between data supplies and users, and business cases to demonstrate the added value of open data. Especially some form of guaranteed funding to offset the losses in revenue is viewed by self-funding NMCAs to be a key factor for the success of sustainable open data.

It appears that open data is instrumental in a shift of the role of NMCAs. After the release of open data NMCAs appear to move from the start of a data value chain as ‘traditional’ data supplier to further down the data value chain and more as a partner and adviser for other organisations. NMCAs no longer have direct contact with the users of the data as open data are largely unknown. This means that NMCA have to adapt the way they interact with (open) data users. Although this leads to more costs in the short term (invest more in

[18] European Commission (2014). Guidelines on recommended standard licences, datasets and charging for the reuse of documents (2014/C 240/01). Brussels, Official Journal of the European Union. **C 240:** 1-10

[19] For problems related to non-interoperability between different versions of CC BY licences, see Chapter 4 of Welle Donker, F. (2016). From access to re-use: a user's perspective on public sector information availability. Faculty of Architecture and the Built Environment. Delft, Delft University of Technology. Ph.D dissertation**:** 278. uuid:56e48c89-6d06-4ae3-8033-2e913ee09bee.

infrastructure and (human) resources), it appears to lead to benefits in the long term for the organisation in the long run, such as efficiency gains.

The EurSDR Workshop Sustainable Open Data Business Models for NMCAs to be held 18 and 19 September 2017 at the Delft University of Technology, Netherlands will use the outcomes of this survey to discuss issues such as:

- Which funding models can be utilised by NMCAs and how sustainable are these?
- What have the effects of open data been on the operational costs of the NMCA?
- Which options do NMCAs have to their disposal to refinance their operational costs?
- Is the supply of open data living up to expectations?
- What are the non-financial challenges to implementing open data?
- Is there a future for a pan-European open data infrastructure?

The questionnaire only allowed room for very general questions and answers; with the workshop we will be able to generate more discussion. Workshop participants will have the opportunity to discuss their hopes and concerns for a sustainable open data ecosystem for self-funding organisations. The combination of academic knowledge and practical experience will provide a deeper insight into the challenges faced by self-funding NMCAs.

References

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) (2007). Official Journal of the European Union. **L 108/1-14:** 1-14. doi: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:108:0001:0014:EN:PDF, Accessed.

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 (2013). European Union, Official Journal of the European Union. **L 175:** 1-8. doi: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:175:0001:0008:EN:PDF, Accessed 21-11-2013.

European Commission (2010). Communication from the Commission of 19 May 2010 to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – A Digital Agenda for Europe [COM(2010) 245 final]. Brussels, European Commission. **COM(2010) 245 final/2** http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=URISERV%3Asi0016, Accessed March 29, 2016.

European Commission (2011). Open Data: An engine for innovation, growth and transparent governance. Brussels. **COM(2011) 882 final:** 13. doi: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0882:FIN:EN:PDF, Accessed June 10, 2013.

European Commission (2014). Guidelines on recommended standard licences, datasets and charging for the reuse of documents, Official Journal of the European Union. **C240/01:** 10. doi: https://ec.europa.eu/digital-agenda/en/news/commission-notice-guidelines-recommended-standard-licences-datasets-and-charging-re-use, Accessed September 11, 2014.

G8 Open Data Charter and Technical Annex (2013). https://www.gov.uk/government/publications/open-data-charter/g8-open-data-charter-and-technical-annex, Accessed September 15, 2015.

Lind, M. (2014). Addresses and Address Data. Socio-economic benefits of Open Address Data experiences in Denmark State of the Map France. Paris, OpenStreetMap France (OSM-FR) http://www.slideshare.net/slideshow/embed_code/33158858, Accessed October 18, 2016.

Obama, B. (2009). Transparency and Open Government. Memorandum for the Heads of Executive Departments and Agencies. Washington, The White House https://www.whitehouse.gov/the_press_office/TransparencyandOpenGovernment, Accessed March 29, 2016.

Omidyar Network (2014). Open for Business: How open data can help achieve the G20 growth target. A Lateral Economics report commissioned by Omidyar Network**:** 84. https://www.omidyar.com/sites/default/files/file_archive/insights/ON%20Report_061114_FNL.pdf, Accessed September 15, 2015.

Ubaldi, B. (2013). Open Government Data, OECD Publishing**:** 61. doi: http://dx.doi.org/10.1787/5k46bj4f03s7-en. Accessed December 12, 2014.

Welle Donker, F. (2016). From access to re-use: a user's perspective on public sector information availability. Faculty of Architecture and the Built Environment. Delft, Delft University of Technology. Ph.D Dissertation: 278. uuid:56e48c89-6d06-4ae3-8033-2e913ee09bee.

Welle Donker, F. and B. Van Loenen (2016). "How to assess the success of the open data ecosystem?" International Journal of Digital Earth: 23 doi: http://dx.doi.org/10.1080/17538947.2016.1224938

Welle Donker, F. and B. van Loenen (2016). "Sustainable Business Models for Public Sector Open Data Providers " JeDEM Journal of eDemocracy & Open Government **8**(1): 28-61, http://www.jedem.org/index.php/jedem/article/view/390, Accessed July 31, 2016.

APPENDIX 1: EUROSDR QUESTIONNAIRE

Start page

EuroSDR, in cooperation with Eurogeographics, would like to assess the effects of open data policies on the business models of National Mapping Agencies (NMAs).We would like to know which adaptations your organisation has made to cope with revenue losses due to open data.
Furthermore, we would like to know what is needed to ensure long-term sustainability of (open) data in your organisation. In addition, we would like to assess the future of open data within your organisation and within your country.

We cordially invite you to complete this questionnaire before April 30, 2017. The outcomes of this questionnaire will be used as an input for a workshop on Sustainable Business Models, to be held in June 2017 in Delft, the Netherlands.

1. ***What is the name of your organisation?***

2. ***What is your name?***

3. ***What is your function with the organisation?***

4. ***In which country is your country located?***

5. ***Since which year does your organisation supply open data? (only one option possible)***

- ☐ before 2010
- ☐ 2010
- ☐ 2011
- ☐ 2012
- ☐ 2013
- ☐ 2014
- ☐ 2015
- ☐ 2016
- ☐ 2017
- ☐ Not applicable, no open data at all

6. ***Could you please give an indication of the breakdown (in percentages as an integer) of the way in which your organisation is funded before the introduction of open data and after open data? Make sure the percentages add up to 100%***

	before open data	after open data	
Central government funding from general revenue			%
Specific taxation			%
Registration fees, e.g. cadastral registration fees			%
Fee-based data supply			%
Fee-based services, e.g. made-to-order products, consultancy			%
Other, namely:			%

7. ***Please list the names of the open datasets of your organisation. If more than 5, please list the 5 main open datasets, preferably in order of popularity***

	Name of open dataset
Most popular	
2nd most popular	
3rd most popular	
4th most popular	
5th most popular	

8. ***How does your organisation finance open data? (more than 1 answer possible)***

- ☐ Through (extra) compensation from central government
- ☐ Through (extra) compensation from public sector high-volume users
- ☐ Through (extra) revenue from other data-related services
- ☐ Through internal efficiency measures
- ☐ Other, namely:
- ☐ Not applicable, no open data

9. ***In which way is the open data policy of your organisation formally embedded? (more than 1 answer possible)***

- ☐ We follow the general open data policy formulated on national level without adaptations.
- ☐ We do not follow the open data policy formulated on national level at all as our organisation is exempt from this policy / falls into an exceptional category
- ☐ We partially follow the open data policy formulated on national level, even though our organisation is exempt from this policy / falls into an exceptional category. If so, which differences are there between the national open data policy and your organisation's policy?
- ☐ We formulated our organisation's open data policy to suit our specific requirements, namely:
- ☐ For our open data, we use Creative Commons licence(s) / declarations, namely: (include version, if applicable)
- ☐ For our open data, we use our own open data licences / declarations, namely:

☐ Not applicable, no open data

10. ***Which measures has your organisation taken to ensure the (long-term) technical, financial and/or organisational sustainability of open data? (more than 1 answer possible)***

☐ We supply data in open data standards
☐ We supply open data tools / platform to facilitate users
☐ We supply metadata in an open format
☐ We supply our data as linked (open) data
☐ We have (re)allocated sufficient financial / human resources to maintain data quality (updates etc.)
☐ We have appointed a (Chief) Data Officer / (Open) Data Steward(s) to champion open data and assist employees
☐ We participate in platforms / forums with other (open) data providers
☐ We participate in open data user groups / forums
Other measures, namely:
☐
☐ Not applicable, no open data

11. ***What are the reasons / motivations for open data within your organisation? Please, indicate the level of importance***

	not important at all	not very important	neutral	somewhat important	very important
We have a legal obligation	☐	☐	☐	☐	☐
Open data (will) lead to higher efficiency / lower transaction costs within our organisation	☐	☐	☐	☐	☐
Open data (will) lead to higher efficiency / lower transaction costs for other organisations	☐	☐	☐	☐	☐
Open data (will) lead to higher data quality (through feedback, etc.)	☐	☐	☐	☐	☐
Open data (will) lead to more transparency / accountability / less corruption	☐	☐	☐	☐	☐
Open data will lead to more economic growth due to companies producing value-added products and services	☐	☐	☐	☐	☐

Open data will lead to more societal benefits	☐	☐	☐	☐	☐
Open data (will) lead to more requests for our fee-based products and services / tailor-made products	☐	☐	☐	☐	☐
Other, namely: ☐	☐	☐	☐	☐	☐
Not applicable, no open data	☐	☐	☐	☐	☐

12. ***How would you assess the level of open data maturity of your organisation? (only 1 option possible)***

- ☐ Pilot phase: open data is a new concept, and not part of our organisation's culture
- ☐ Project phase: our organisation is willing to experiment with open data but continuation of project will depend on success of the project
- ☐ Programme phase: organisation sees the advantages of open data but there are still questions / issues to be addressed
- ☐ Open data are institutionalised within the organisation and has become part of the organisation's culture
- ☐ Open data are not only institutionalised within our organisation, our organisation is also considered to be a leader in the open data field / a role model for other organisations
- ☐ Other, namely: ☐
- ☐ Not applicable, no open data ➪ If not applicable, please skip the next question.

13. ***Which effects has open data supply had on your organisation? (more than 1 answer possible)***

- ☐ No noticeable effect, open data are only a small part of our services
- ☐ We have to employ extra server capacity due to increased data traffic
- ☐ We have to employ extra security measures to safeguard our other non-open datasets
- ☐ We receive(d) more questions related to technical aspects of the data (how to use the data, data formats, etc.)
- ☐ We receive(d) more feedback related to data quality (error reports, etc.)
- ☐ We receive(d) more requests for additional datasets
- ☐ Our revenue of fee-based data / services has dropped significantly
- ☐ We receive(d) more requests for fee-based data / services (with Service Level Agreements, higher level of detail, etc.)
- ☐ We receive(d) more requests for tailor-made / consultancy products and services
- ☐ Our revenue of fee-based services has increased
- ☐ We receive(d) complaints from companies (e.g. claiming unfair trading practices)
- ☐ We receive(d) requests from other organisations for advice on open data implementation
- ☐ Other, namely: ☐
- ☐ Not applicable, no open data

14. ***What is your vision on the future of open data in your organisation?***

15. ***What is your vision on the future of open data in your country?***

16. ***In your opinion, which success factor(s) have or will contribute the most to a sustainable open data ecosystem?***

17. ***You can use this box to provide comments and/or additional information to your answers, if needed. If you want to, you can leave your e-mail address, so we may contact you if you would like us to do so.***

Closing page

Thank you for your time. We hope to see you in Delft, the Netherlands in June.