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Strategic directions in the work of statistical offices and geospatial agencies

Integration of geospatial and statistical data

Building capacity in statistical and geospatial data integration across the United Nations Economic Commission for Europe region

Prepared by the Secretariat[1]

Summary

The adoption of the 2030 Agenda for Sustainable Development has brought the need for harmonized data of increasing quality, accuracy, timeliness and granularity to the forefront of global, regional and national agendas to support the measurement and monitoring of the Sustainable Development Goals. Both national statistical offices (NSOs) and national mapping and cadastral agencies (NMCAs) play a central role in this data revolution. The integration of statistical and geospatial data has been described as "one of the most promising paths to provide more timely, reliable and detailed information … that can result in new insights that we could not otherwise gain" (Eurostat, The integration of statistical and geospatial information – A call for political action in Europe (Luxembourg: Publications Office of the European Union)).

While global efforts to drive the greater integration of statistical and geospatial data have been ongoing for a decade through the work of the United Nations and other international and regional bodies, the benefits have not yet been fully and consistently realized across different countries and regions. Recognizing this shortfall, the European Commission has funded a project, led by the United Nations Economic Commission for Europe (UNECE), to develop greater capacity in geospatial and statistical data integration across the UNECE region. A European Union Contribution Agreement was established between the European Union (EU), represented by the European Commission, and UNECE in July 2022.

This document summarizes the results of some of the activities undertaken as part of the contribution agreement. This includes desk research, a survey and a workshop on integrating statistical and geospatial information. Further information and more detailed results are available from the Integration of Geospatial and Statistical Data site.

[1] Prepared by the UNECE consultant supporting the project, Sara Stewart in March 2024.

I. The importance of integrating statistical and geospatial information

1. We live in an increasingly digital world and the way we live and work has been transformed by technology which is advancing at ever faster rates. With all that digital transformation come infinite amounts of data which can be used to better understand our world through both space and time and provide an important evidence base to address some of the biggest challenges faced by society, such as climate change, global health issues, political conflict, and poverty. The adoption of the United Nations 2030 Agenda for Sustainable Development has driven the need for better data that is accurate, current, detailed, and comparable in order to measure and monitor the Sustainable Development Goals (SDGs). The integration of geospatial and statistical data (or data integration for short) has been recognized as one of the most promising ways to produce high-quality data that meets these requirements and can be defined as "the practice of incorporating and consolidating both kinds of sources [geospatial and statistical] into a single dataset, with the ultimate goal of providing users with consistent access to, and delivery of, information across the geographical, social, economic and environmental spectrums" (PARIS21 Guide on Geospatial Data Integration in Official Statistics, p. 11).

2. Geography provides an ideal framework to bring together different layers of information across both space and time. Through the use of different spatial scales, ranging from small grid squares through to entire countries and regions, the possibilities of analysis and interpretation are endless. There are many benefits of integrating geospatial and statistical data – too many to include here – but in a nutshell, some of the main benefits include:

(a) Enhancing the value of the statistical and geospatial data itself by improving its quality – as data is integrated, quality issues (such as missing or inaccurate data) can be identified and corrected, leading to more accurate data in the long term.

(b) Improving the interoperability of datasets – connecting different systems and data sources through a common framework to easily share and combine information.

(c) Providing new possibilities for data analysis and presentation – moving from simple choropleth maps towards more complex geostatistical outputs and grid-based visualizations.

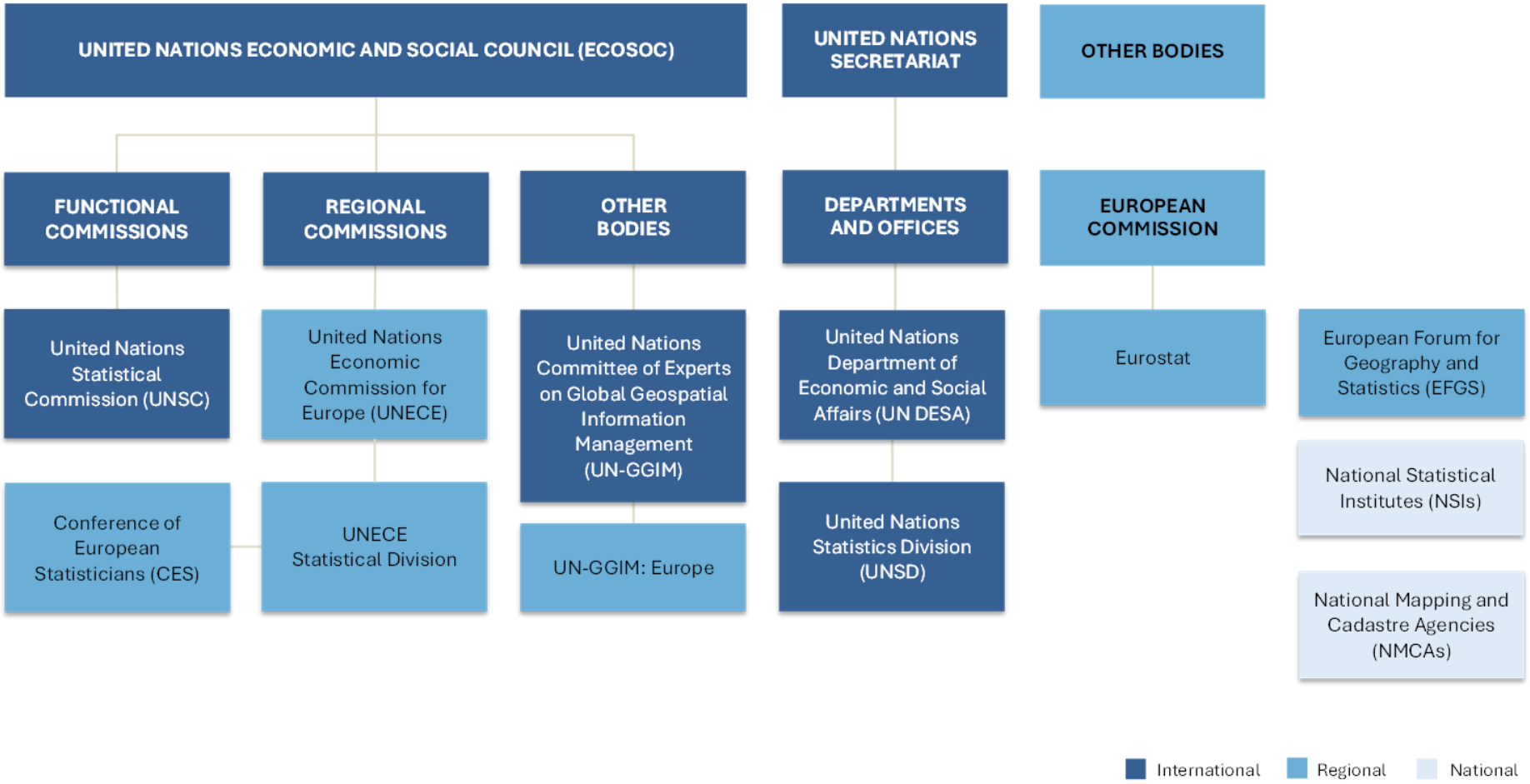
(d) Resulting in greater insights which can inform decision-making and policy development at all levels – from local, to regional and global scales.

II. The key players who are driving data integration activities

3. Global efforts to drive the greater integration of geospatial and statistical data have been going on for a decade and have been centred on the work of the United Nations and its various divisions and bodies, particularly the United Nations Statistics Division and the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM). From this global stage, data integration activities have been increasingly extended and adapted to different regional contexts. In Europe, for example, this work is led by four key players: UNECE, Eurostat, the Regional Committee of United Nations Global Geospatial Information Management for Europe (UN-GGIM: Europe), and the European Forum for Geography and Statistics. There are also great examples of data integration activities within the national statistical and geospatial organizations which are supporting other countries who are not so advanced in their data integration journeys. The key players, at international, regional and national levels, are outlined in Figure 1.

Figure 1

Main organizations and bodies working in the field of integrating statistical and geospatial information



III. Recent developments in the field of data integration

4. Activities to progress the greater integration of geospatial and statistical data have been going on for a decade and some of the highlights are provided below.

A. At a global level

5. UN-GGIM Expert Group on the Integration of Statistical and Geospatial Information aims to raise awareness and promote the importance of integrated statistical and geospatial information to support decision-making and policy development across all political levels. Their work includes the development of the Global Statistical Geospatial Framework (GSGF) which was adopted by the Committee of Experts at their ninth session as a bridge to facilitate the integration of a range of data from both the statistical and geospatial communities. At their tenth session, the Committee of Experts also adopted the United Nations Integrated Geospatial Information Framework (UN-IGIF) to assist countries in the development and enhancement of their own geospatial information management processes.

6. The Global Forum for Geography and Statistics (GFGS) acts as a global network on geography and statistics to present, share and discuss new ideas and best practice relating to geospatial and statistical data. GFGS, in collaboration with UNECE and the European Free Trade Association (EFTA), currently run a series of coffee talks to present, share and discuss emerging ideas and good practices relating to geospatial and statistical information.

B. At a regional level

7. UN-GGIM: Europe's Working Group on Data Integration focuses on the integration of geospatial data with other information including statistical data, and is currently running a webinar series on data integration.

8. Eurostat undertakes activities relating to GISCO (the Geographic Information System of the Commission) which include coordinating Commission-wide geographic information activities, promoting the use of geospatial data within the European Statistical System, chairing a working group on the integration of statistical and geospatial information, and overseeing annual funding calls for project proposals relating to data integration.

9. The European Forum for Geography and Statistics (EFGS) have worked in collaboration with Eurostat on the GEOSTAT Projects which have focused on the development of common guidelines for grid-based and geospatial statistics for use by national statistical and geospatial organizations to promote the greater integration of statistical and geospatial data across the European Union. The GEOSTAT 4 project has conceptualized and interpreted the Global Statistical Geospatial Framework within the European context, publishing GSGF Europe in 2021.

10. UNECE High-Level Group for the Modernisation of Official Statistics (HLG-MOS) works to advance the modernization of official statistics. They have published a Guide to Data Integration for Official Statistics as well as a Geospatial View of Generic Statistical Business Process Model (GeoGSBPM). UNECE has also recently embarked on a new project to produce internationally agreed guidance for the next round of censuses in 2030 under a number of key themes including technology, looking at GIS data and related approaches, and geospatial information and small area statistics for censuses which will further promote the data integration agenda within a global update of international guidance for censuses.

IV. Recent developments in the field of data integration

11. Recognizing the potential for growth, the European Commission has funded a 21-month project, led by UNECE, to develop greater capacity in statistical and geospatial data integration across the UNECE region to foster stronger links between the two communities,

support greater collaboration and encourage greater data integration through the promotion of stronger institutional partnerships and the adoption of common standards. The project has supported existing activities to strengthen the integration of statistical and geospatial information by Eurostat, UN-GGIM: Europe and others, and has had a particular focus on sixteen selected target countries in South-eastern and Eastern Europe, Caucasus and Central Asia.

12. A number of key activities were undertaken as part of the project including:

(a) Issuing an online survey to gain stakeholder insights on data integration.

(b) Organizing a Joint UNECE / Eurostat / UN-GGIM: Europe Workshop on Integrating Statistical and Geospatial Data which took place in Belgrade, Serbia on 4 - 5 October 2023.

(c) Establishing a UNECE-led task force on standards issues relating to data integration.

(d) Creating supportive material on data integration including a UNECE wiki space, a blog series called INGEST, and other documentation.

13. By carrying out these activities, the project aimed to:

(a) Increase awareness of the need for more integration of geospatial and statistical data, especially within the project's target countries.

(b) Develop a better understanding of the limitations of current geospatial and statistical data standards in the context of data integration.

(c) Improve collaboration between the geospatial and statistical communities based on greater mutual awareness and understanding.

V. United Nations Economic Commission for Europe Survey on the Integration of Statistical and Geospatial Information

A. Background and context

14. The UNECE Survey on the Integration of Statistical and Geospatial Information was developed as part of the wider project to obtain valuable insight on data integration from statistical and geospatial communities across the UNECE region, to ensure that the views of key stakeholders were included within the project, and to acquire user-centric feedback to accurately inform and target the direction of future project activities.

15. The survey was designed around four key areas:

(a) The use of data and technology to support data integration.

(b) The level of involvement in wider activities relating to geospatial and statistical data integration at national and international levels.

(c) Develop an understanding of the issues and obstacles limiting the greater integration of geospatial and statistical data, structured using the strategic pathways of the United Nations Integrated Geospatial Information Framework (UN-IGIF).

(d) Provide an opportunity for national statistical offices (NSOs) and national mapping and cadastral agencies (NMCAs) to register their interest in future project activities.

16. The UNECE Survey was issued to all NSOs and NMCAs located across the UNECE region in the spring of 2023 and received a great response, with 67 organizations from 49 countries responding to the survey. Survey respondents came from across the UNECE region and beyond, including Brazil, Chile, China, Colombia, India, Japan, and Mexico. Forty-five (67 per cent) respondents were from NSOs, 18 (27 per cent) were from NMCAs, and 4 (6 per cent) were from other institutions (where the national statistical and geospatial functions were combined or had an academic or research function). Fifteen respondents came from a project target country located in Eastern Europe, Caucasus or Central Asia. In 17 countries, responses

were received from both the NSO and NMCA, ensuring that valuable dual perspectives from statistical and geospatial communities were obtained at national levels. Four of these countries were a target country of the project. An overview of the results of the UNECE Survey are presented below.

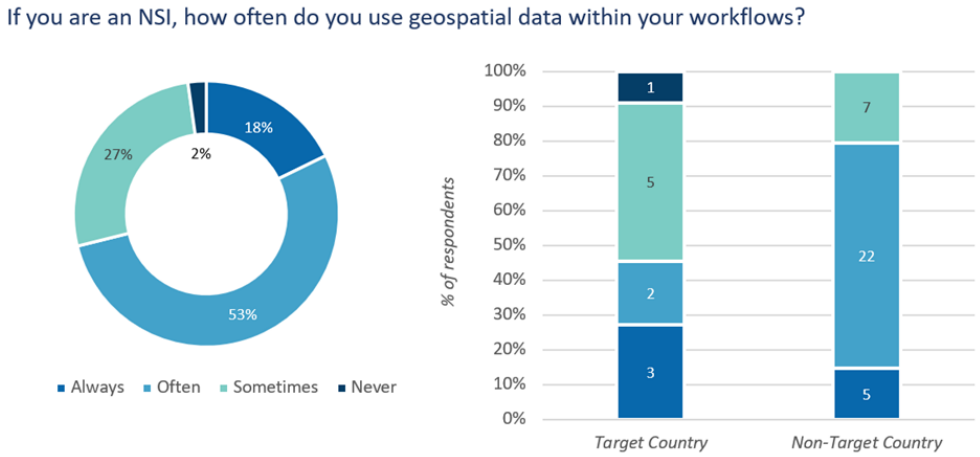
B. Data and technology

17. On a global scale, society is becoming ever more data-driven with more than 2.5 quintillion bites of data being generated every day. The availability of quality data that is accurate, comprehensive, at an appropriate level of detail and temporality, and from verifiable and authoritative sources, is critical for evidence-based decision-making and policy development across all levels. Data plays a central role in the 2030 Agenda and the ability to fully measure and monitor progress on SDGs. Not only is the quality of data important, but also the strength of the technical infrastructure which underlies its creation, management, use and dissemination within and across organizations. A strong data infrastructure will ensure better efficiency and productivity of its users, ease of collaboration between different groups, and securely managed access to organizational data for both internal and external users. By utilizing appropriate digital technologies and methodological frameworks to collect, analyse and interpret data, real actionable insights can be obtained. Yet, these benefits have not yet been fully realized in a consistent way as the World Bank notes: “Even as new technology makes more data and wider uses of data possible, there are still many blank spaces on the global data map”. While both the quality and availability of data has been growing over recent years, in general, it is considered that “statistical capacity still needs strengthening and data literacy must be enhanced at all levels of decision-making” which will “require coordinated efforts on the part of data producers and users from multiple data systems” (United Nations Statistics Division).

18. The quality and accessibility of statistical and geospatial data, and the strength of the technical infrastructure that supports it throughout its life cycle, is central to the data integration agenda. At a global level, it has been recognized that advances in the integration of statistical and geospatial data have “benefitted from the availability of powerful geospatial tools that enhance the value and usability of official statistics by leveraging the application of the spatial context” (PARIS21). The GEOSTAT 4 / GISCO survey also revealed that around 50 per cent of the countries surveyed reported that they had a strong and sustainable data infrastructure that could support the integration of statistical and geospatial information. The INSPIRE Directive also brought the importance of metadata, and its uniform structure, to the fore in the management of spatial datasets, providing definitions and lists of categories to describe the content, data type, and usage. As UNECE have highlighted, there is also the “prior existence of flexible frameworks for the modernization of official statistics that can be adapted to include geospatial information with little impact on the existing organizational structure”. For example, UNECE Generic Statistical Business Process Model (GSBPM) has recently been enhanced to include a geospatial perspective, appropriately termed GeoGSBPM. From these few examples, it is clear that good progress has been made at global and regional scales to highlight and support the development and maintenance of high-quality data and robust technical infrastructures, but issues still remain which hinder the greater integration of statistical and geospatial information at national levels.

19. Recognizing the central role that data and technology play in the integration of geospatial and statistical information, the UNECE Survey asked respondents a number of questions relating to their organizational use of data and technology. Some highlights are presented below.

Figure 2
NSO use of geospatial data



20. Most respondents from NSOs often (53 per cent) or always (18 per cent) used geospatial data within their workflows (Figure 2). Only one NSO respondent never used geospatial data in their workflows. A lower proportion of NSO respondents from the project's target countries (located in Eastern Europe, Caucasus and Central Asia) always or often used geospatial data within their workflows (45 per cent) in comparison to non-target countries (79 per cent). Respondents noted a broad range of uses for geospatial data within statistical processes, with the most common relating to census operations, geocoding, spatial analysis, and dissemination activities. Several respondents also discussed their production of grid statistics, particularly in relation to population and age information.

21. An overwhelming majority (84 per cent) of NSO respondents have, or are planning to incorporate, geospatial data within the 2020 census round (Figure 3). The proportion of NSOs using geospatial data within their census activities was much lower in target countries (55 per cent) than non-target countries (94 per cent). The most common uses of geospatial data within census operations related to the geocoding of address data for building and dwelling registers, the production of enumeration areas, the monitoring of data collection and census progress, and the creation and dissemination of grid statistics (primarily at the 1 kilometre-squared grid level but as high as 100 metres-squared).

Figure 3
NSO use of geospatial data or approaches within the 2020 census round

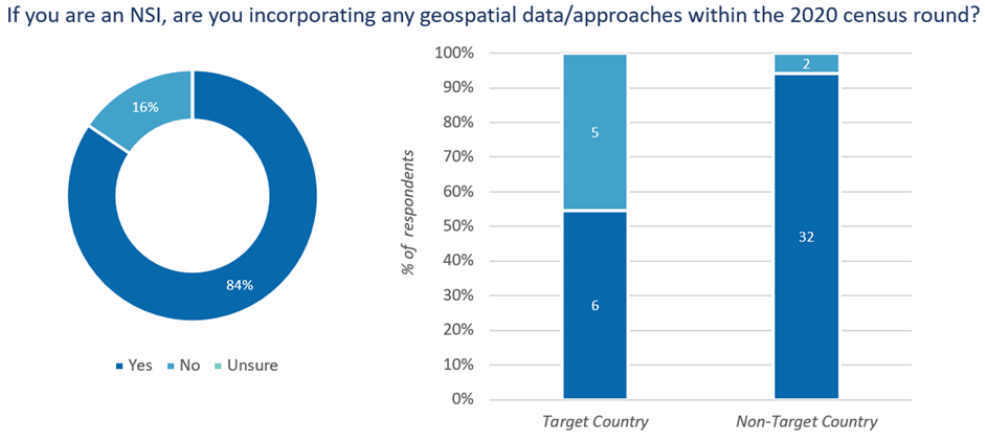
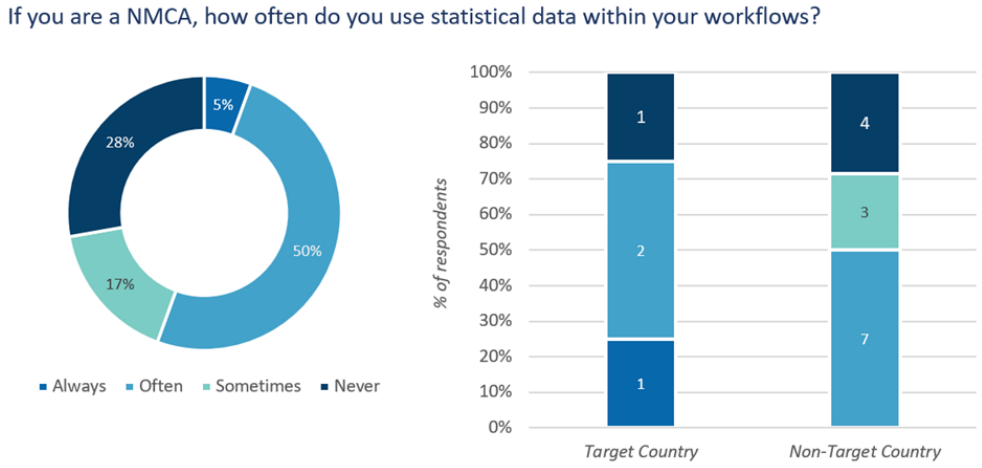


Figure 4
NMCA use of statistical data within their workflows



22. A slight majority of respondents from NMCAs often (50 per cent) or always (5 per cent) used statistical data in their workflows (Figure 4) which is much lower than the converse reported by NSOs (as above). Twenty-eight per cent of NMCA respondents never used statistical data in their workflows which is much higher than the converse reported by NSOs. A higher proportion of NMCA respondents from target countries always or often used statistical data (75 per cent) than from non-target countries (50 per cent). Common uses of statistical data within geospatial activities included within data production and management processes, thematic map production (particularly using population and census data), and spatial analysis using demographics and deprivation indices to inform policy development and emergency preparedness and response.

Figure 5
Access to GIS software

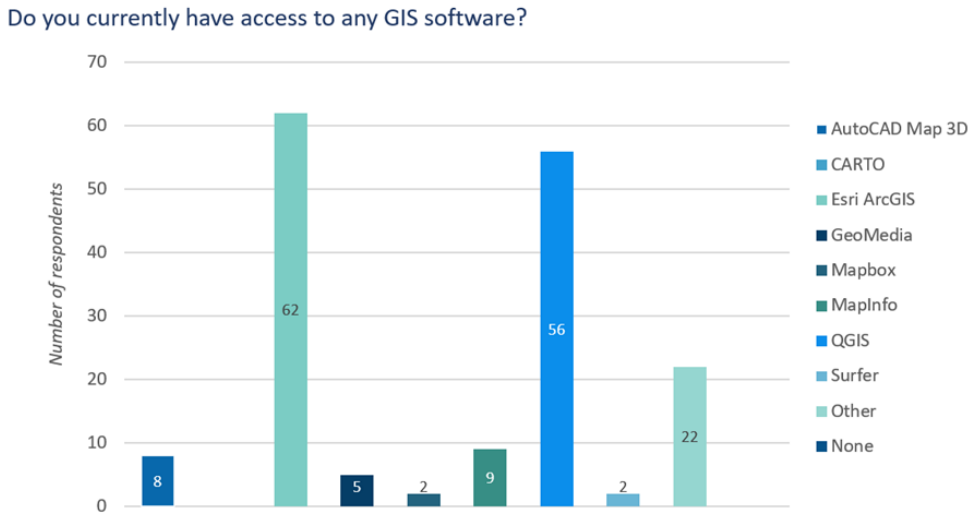
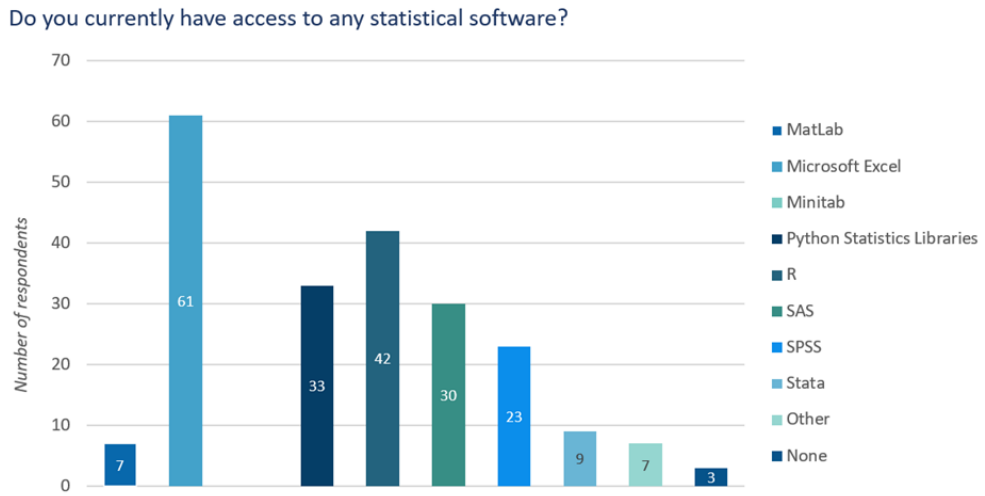


Figure 6
Access to statistical software



23. All respondents, whether NSO or NMCA, had access to some form of GIS software (Figure 5), with the most popular being Esri ArcGIS software (37 per cent) followed closely by open-source QGIS software (34 per cent), and then other more bespoke or internally developed software applications and packages (22 per cent).The vast majority of respondents (with the exception of three organizations) had access to one or more statistical software packages (Figure 6), the most common being Microsoft Excel (28 per cent), R (20 per cent) and Python Statistics Libraries (15 per cent).

24. These highlights from the survey suggest that organizations who responded to the survey are integrating geospatial/statistical data within their workflows and have a good level of access to relevant software to support such tasks. It is clear, however, that there are some disparities in the extent of data integration activities between NSOs and NMCAs and, similarly, between target and non-target countries.

C. Collaboration and partnerships

25. Partnerships, in other words, the strategic alliance of two or more parties who agree to cooperate to advance their shared interests and achieve common goals, have long been viewed as key tools of effective governance. Some partnerships may focus on the delivery of local initiatives at national levels, developing or adapting policy frameworks to better suit the needs of local societies and economies. Other partnerships may seek to coordinate broad policy areas at regional and international scales. But in all cases, successful partnerships are centred around collaboration, drawing on the unique skills that each partner brings to their alliance in order to create new value together (Collaborative Advantage: The Art of Alliances). At a time when rapid technological change, growing economic and political uncertainty, mounting concerns for the environment and the impacts of climate change, and the effects (whether direct or indirect) of the COVID-19 pandemic transcend national and regional boundaries, effective strategic partnerships can offer valuable contributions to sustainable development and the delivery of innovative, inclusive, targeted, and cost-effective solutions to benefit society.

26. The strategic partnerships and collaborative activities in place across the statistical and geospatial sectors are strong, long-standing and of benefit to the data integration agenda. Eurostat has observed that statistical and geospatial data integration is growing rapidly in some European countries due to close cooperation between national statistical and geospatial organizations. The European Committee of the Regions further notes that “pan-European interoperability in most fields is still a future goal, however, good progress has been made in particular by several phases of the GEOSTAT projects also regarding the establishment of cooperation between institutions and the integration of spatial and statistical data”. PARIS21, as a global partnership of experts and policymakers in statistics, has also identified that

governments in many low-income countries are already implementing multi-stakeholder approaches to progress statistical and geospatial data integration which is very promising. It is, however, important that the international and regional partnerships already in place, some of which are undertaking similar activities relating to data integration, work together to ensure that their workstreams are aligned, and not duplicated, so there is a clear overarching voice that transcends across the different policy frameworks and guidelines that national statistical and geospatial organizations are encouraged to adopt. At national levels, the traditional separation of statistical and geospatial organizations has historically hampered efforts to collaborate with each other, although this is now changing with many good examples of national collaboration in practice.

27. In light of the importance of effective collaboration and partnership arrangements to support activities to integrate statistical and geospatial data, the UNECE Survey asked respondents a series of questions to understand the level of involvement in wider activities relating to data integration at both national and international levels. Some key findings are presented below.

Figure 7
Cooperation with national statistical or geospatial counterpart

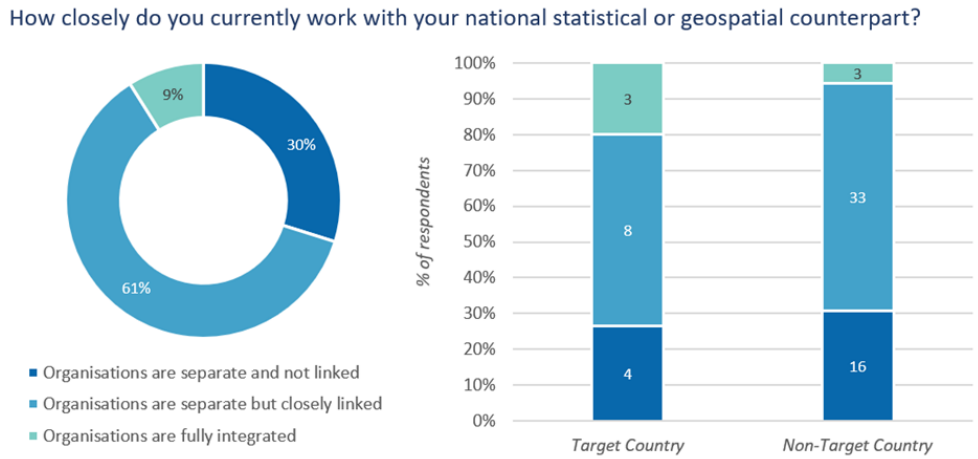
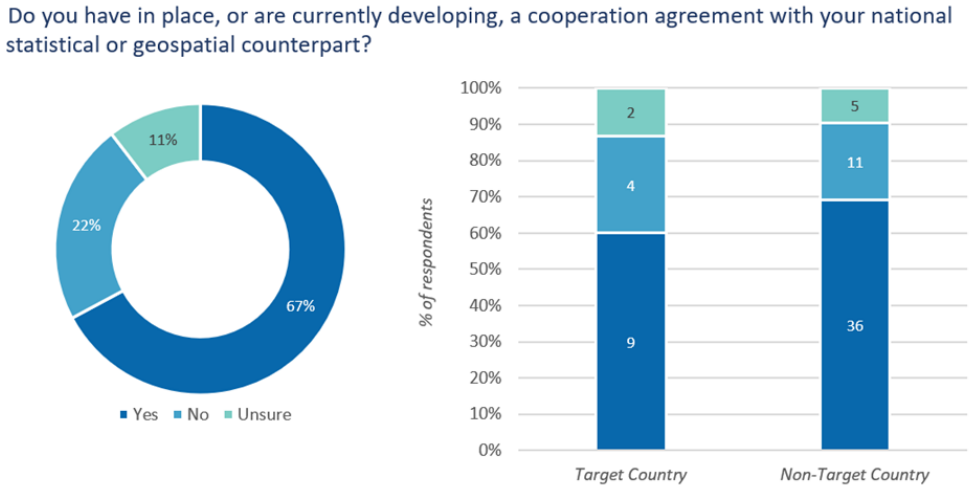


Figure 8
Presence of cooperation agreement with national statistical or geospatial counterpart



28. Survey respondents were asked how closely they worked with their national statistical or geospatial counterpart (Figure 7) and most respondents noted that their organizations were separate but closely linked (61 per cent). Only 9 per cent of respondent organizations were fully integrated with their statistical or geospatial counterpart. These patterns were broadly reflected across both target and non-target country organizations. Most respondents (67 per cent) had a cooperation agreement in place with their national statistical or geospatial

counterpart which suggests that there is a relatively good level of cooperation at national levels (Figure 8). Target country organizations had a marginally lower level of cooperation (60 per cent) than non-target countries (69 per cent). While the form and type of cooperation varied from country to country, ranging from legal obligations to ad hoc meetings, the most common cooperation mechanisms consisted of data sharing agreements, memorandums of understanding, and bespoke agreements (e.g. service level agreements). Several organizations are actively working on the development of national cooperation mechanisms to strengthen their governance frameworks, the exchange of information, and the ability to integrate statistical and geospatial information.

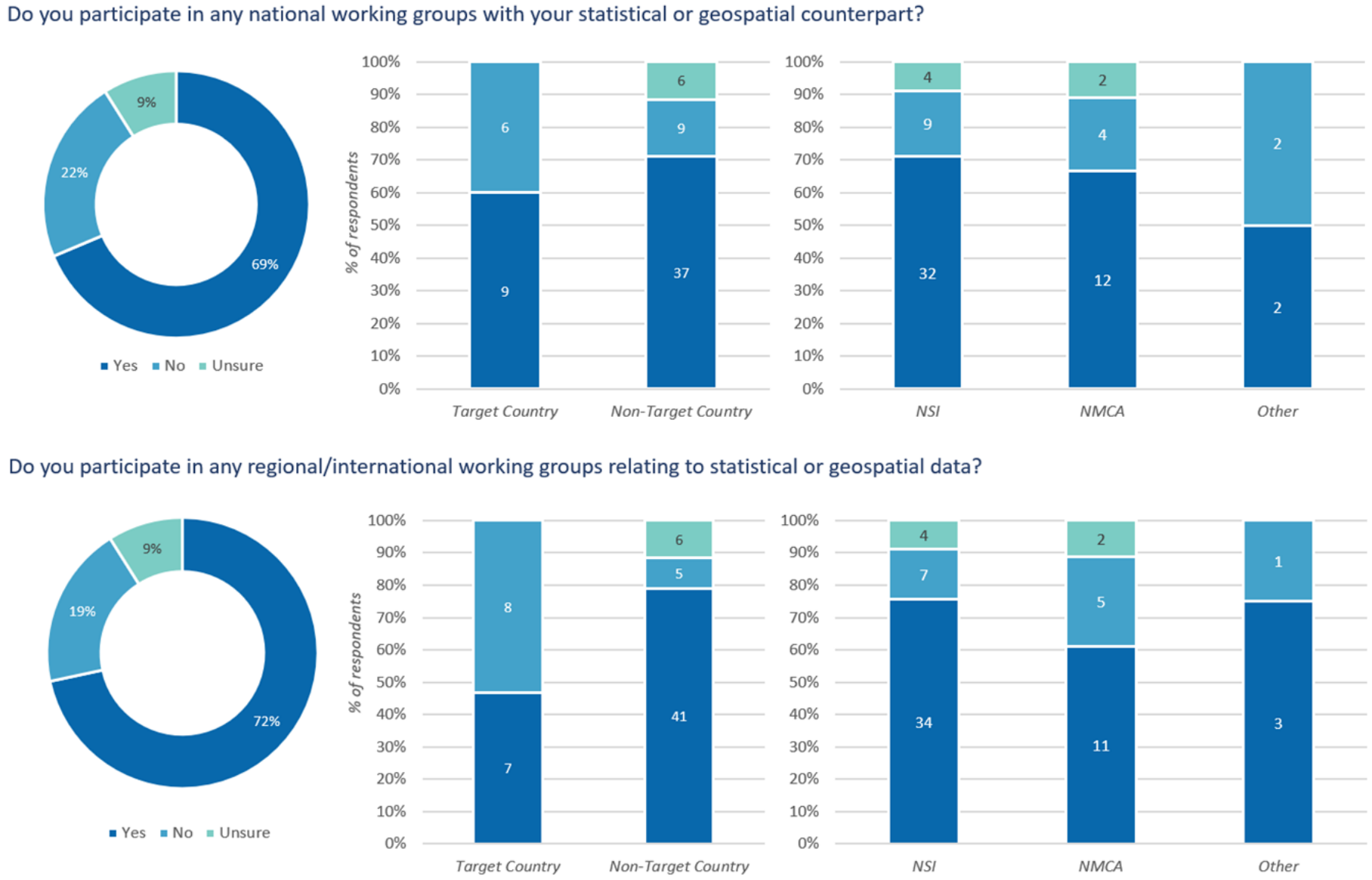
29. Respondents were asked if their organization currently participated in any national working groups with their national statistical or geospatial counterpart and the majority of respondents (69 per cent) stated that they did (Figure 9). A marginally lower proportion of respondents from target countries took part in national working groups with their counterpart (60 per cent) than from non-target countries (71 per cent), indicating that some additional support may be needed to establish and strengthen national partnerships within target countries. The level of participation was largely the same across organization types (72 per cent for NSOs and 67 per cent for NMCAs). Respondents discussed their joint participation in a wide variety of working groups, meetings, and organized activities, for example, to address the Demography and Statistical Units themes of the INSPIRE Directive, to collaborate on updating land use and land cover thematic map classifications which support statistical production and ecosystem accounting, for data validation, and in spearheading the use of geospatial data.

30. Respondents were also asked if their organization currently participated in any regional or international working groups relating to statistical or geospatial data and the majority of respondents (72 per cent) stated that they did. A much lower proportion of respondents from target countries participated in regional or international working groups (47 per cent) than from non-target countries (79 per cent) which clearly indicates that much more needs to be done to encourage broader target country engagement and participation in regional and international activities which may, in turn, help to progress data integration within national contexts. Respondents were involved in over 60 regional or international working groups, the most cited being the GISCO Working Group led by Eurostat, the UN-GGIM Expert Group on the Integration of Statistical and Geospatial Information, the UN-GGIM: Europe Working Group on Data Integration, the European Forum for Geography and Statistics, and the work of UNECE and EuroGeographics. Other working groups also mentioned included the Open Geospatial Consortium, the European Land Registry Association, the INSPIRE Knowledge Exchange Network, and the Working Group on Regional, Urban and Rural Development Statistics.

31. These snapshots from the survey indicate that while the overall level of participation in regional and international activities related to geospatial and statistical data is good overall, as are the breadth and variety of the working groups attended, more needs to be done to explore why levels of engagement from target countries are significantly lower and determine how this can best be remedied. Respondents highlighted the importance of established and agreed collaboration through multilateral partnerships as well as the need to build greater awareness about the strength of partnerships and cooperation amongst different data providers that ensure that reliable, objective, accurate and consistent data can be produced, shared and integrated.

Figure 9

Participation in national and regional/international working groups relating to data integration



D. Issues and obstacles

32. The UN-IGIF is a reference guide to support Governments in the development and strengthening of integrated geospatial information management practices and their inclusion in national plans and strategies. It is also intended to be used as a tool for engagement that will lead to better "coordination, collaboration and coherence across government when working towards strengthening national geospatial information management" (UN-IGIF Part 1 – Overarching Strategic Framework).

33. It has nine strategic pathways which relate to three broader areas of influence: governance, technology, and people.

(a) Governance and Institutions

(b) Legal and Policy

(c) Financial

(d) Data and Technical Infrastructure

(e) Innovation

(f) Standards

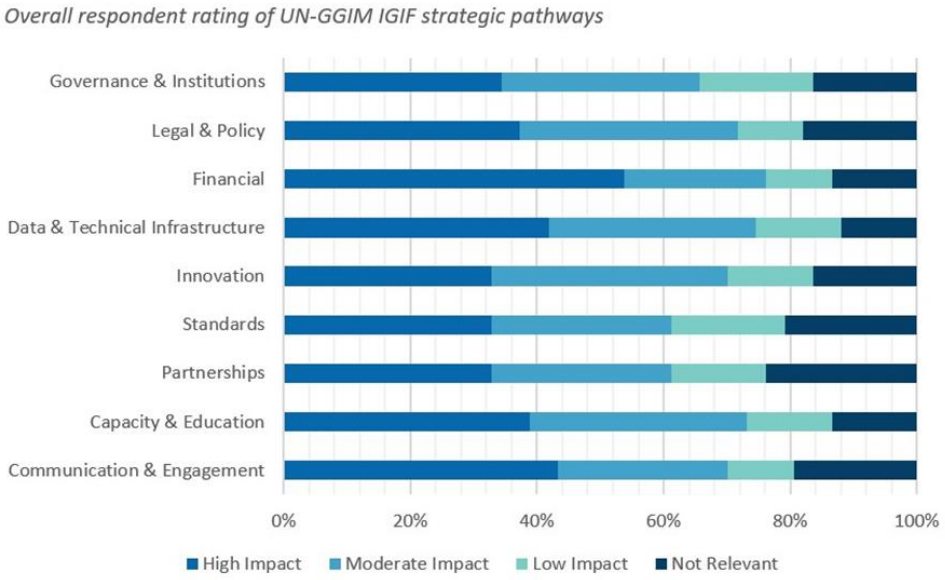
(g) Partnerships

(h) Capacity and Education

(i) Communication and Engagement.

34. Given the importance and relevance of this framework to the integration of geospatial and statistical information, the UNECE Survey asked respondents to rate, from their organization's perspective, the degree of impact that each strategic pathway had on their ability to progress data integration activities and were asked to provide further information on those ratings.

Figure 10
Level of impact of the UN-IGIF strategic pathways on data integration activities



35. Figure 10 shows the overall respondent rating of the degree of impact that each UN-IGIF strategic pathway had on their organization's ability to progress activities to integrate statistical and geospatial data. The top three strategic pathways which were rated as having the highest impact on data integration were:

(a) Financial

(b) Communication and Engagement

(c) Data and Technical Infrastructure.

36. Financial issues were identified as the biggest obstacle to the greater integration of statistical and geospatial data across the UNECE region, with 54 per cent of survey respondents ranking it as high impact. The level of impact was drastically higher for organizations in target countries (73 per cent) than non-target countries (48 per cent), but relatively similar for NSOs (56 per cent) and NMCAs (50 per cent). Respondents noted the lack of financial support, both through the appropriate allocation of government funding and the lack of investment by international and EU donors, as the biggest financial obstacle to greater data integration. They emphasized that the issue would only be compounded by the impact of future planned budget cuts at some government levels, threatening the sustainability of systems and the technical infrastructure required for effective and efficient data life cycles. One respondent highlighted the lack of sustainable financial resources necessary to create and maintain their national spatial data infrastructure which was particularly impacting the improvement and implementation of national and international standards for their primary geospatial datasets. Another noted that part of their organizational budget came from custom work packages from government and private organizations, but the overly bureaucratic procedures required to get such work funded and initiated required lot of staff time and resource that could be better spent elsewhere. Several respondents also highlighted the importance of, and need for, adequate investment in staff training to ensure highly qualified staff could contribute effectively to data integration activities. Also of importance was the ability to fund and maintain innovative hardware and software packages and the efficiency gains they could bring. Overall, as one participant aptly summarized, there is a need for decision makers to understand the concrete benefits of data integration so they can invest in such activities and raise the capacity of key institutions and the qualifications of staff. New financial models are needed based on investment needs and funding sources for the delivery of integrated statistics and geospatial information management.

37. Issues relating to communication and engagement were ranked as having the second highest impact on the greater integration of geospatial and statistical information, with 43 per cent of respondents rating it as high impact. A marginally higher number of respondents from target country organizations rated it as high impact (47 per cent) than from non-target countries (42 per cent). A much more marked difference was, however, evident by organization type as 72 per cent of respondents from NMCAs rated it as high impact in comparison to 31 per cent of respondents from NSOs, indicating that more efforts were required to improve communication and engagement strategies towards geospatial organizations in particular. Respondents highlighted the need for greater engagement with decision makers at strategic levels through the development of stronger communication strategies which emphasize key messages around the benefits of integrating statistical and geospatial information and its importance for evidence-based decision-making to support the 2030 Agenda and the achievement of its SDGs. Some respondents also noted the need for more open communication between NSOs and NMCAs, a shared commitment to data integration activities, and established and agreed roles to progress data integration at national levels, particularly centred around the promotion of National Spatial Data Infrastructures and their role in supporting all stages of the statistical process. It is clear that new communication and engagement strategies are needed to promote the benefits of data integration to a much broader target audience than present, actively engaging with decision makers from target country organizations and NMCAs in particular. In growing awareness of, and acquiring buy-in to, data integration activities, real progress can be made, and the benefits truly realized.

38. Data and technical infrastructure issues were ranked as having the third highest impact on the integration of geospatial and statistical data, with 42 per cent of respondents rating it as high impact. The level of impact was much higher for target countries (53 per cent) than non-target countries (38 per cent) and, similarly, for NSOs (49 per cent) than NMCAs (28 per cent). This clearly indicates that more efforts are required to support data integration activities within NSOs, particularly in the target country areas. Respondents cited that the biggest obstacles related to data interoperability, with different data collection and storage methods, unstandardized data formats, and a lack of unique identifiers resulting in an inability

to integrate data sources from different institutions. The quality, currency and completeness of available data were also noted as impacting data integration activities, as was the ability to make data available to share and reuse through robust and secure technical infrastructures and standardized procedures. Limitations in hardware and software components, particularly relating to performance issues, the need for major system upgrades and additional servers, as well as support for dedicated software packages, were further impacting the ability to progress data integration activities. In many ways, the issues and obstacles cited above are very much a consequence of the financial issues discussed above as well as the lack of appropriate standards for data harmonization. A multifaceted approach is therefore necessary to ensure that data and the technical infrastructure it sits within are suitable for data integration activities that are sustainable into the future.

E. Some recommendations

39. While much work has been undertaken to support the greater integration of geospatial and statistical information, the survey results highlight that more must be done to embed data integration activities within business-as-usual practices in a comparable and consistent fashion across the UNECE region. There are a range of multidimensional issues and obstacles still to be overcome, given the wide variance in national governance frameworks, laws and policies, the ability to access adequate and sustainable financial resources, the level of cooperation with other national and international bodies, the adherence to wider policy frameworks and common standards, the ability, skills and capacity to innovate, and effectively communicate the need for data integration activities and their associated benefits to both decision makers and the wider user community.

40. In light of the issues and obstacles identified by the UNECE Survey, some recommendations can be made:

(a) Identify and promote sustainable funding resources and models to support data integration activities at national levels.

(b) Enhance communication and engagement strategies to grow awareness of the benefits of data integration and better support the sharing of best practice and new technologies.

(c) Promote greater data standardization and interoperability through the use of harmonized standards, operating models, production processes and services.

41. These recommendations could support and complement other key recommendations made by UNECE, Eurostat and others in the field of data integration and, in their adoption, may provide a driving force for change so that the value of data integration is fully realized and data of sufficient quality, accessibility, currency, reliability and granularity is produced consistently to protect people, the planet, prosperity, peace and partnerships so that “no one will be left behind” (United Nations).

VI. Recent developments in the field of data integration

A. Workshop context

42. The first Joint UNECE/Eurostat/UN-GGIM: Europe Workshop on Integrating Statistical and Geospatial Information was organized by UNECE in collaboration with Eurostat and UN-GGIM: Europe as part of UNECE project funded by the European Union. The workshop took place over two days on 4 and 5 October 2023 and was hosted by the Republic Geodetic Authority of Serbia in the House of the National Assembly in Belgrade, a beautiful and iconic building that is the seat of the National Assembly of Serbia. A number of side meetings also preceded the workshop, taking place on 3 October in the Old Serbian Parliament Building, another important building in Belgrade used by the National Assembly for its administrative functions. These side meetings consisted of a Meeting of the Task Force on Standards Issues which has recently been established by UNECE to explore standards issues relating to the integration of geospatial and statistical data and the 9th Joint UN-GGIM:

Europe – ESS – UNECE Meeting on the Integration of Statistical and Geospatial Information where leading organizations in the field of data integration shared their current and future planned activities as a means of coordinating activities and forging greater cooperation.

B. Attendance

43. The workshop was attended by over 60 representatives from NSOs, NMCAs, intergovernmental organizations and private sector organizations, with 28 different countries represented from across the UNECE region, spanning from the United States of America in the west as far as Kazakhstan in the east. The UNECE member states in attendance were Albania, Armenia, Austria, Belgium, Bosnia and Herzegovina, Finland, France, Georgia, Germany, Ireland, Italy, Kazakhstan, Kyrgyzstan, Malta, Netherlands (Kingdom of the), North Macedonia, Norway, Poland, Portugal, Republic of Moldova, Serbia, Slovakia, Slovenia, Sweden, Switzerland, Ukraine, the United Kingdom of Great Britain and Northern Ireland, and the United States of America. The workshop was also attended by representatives from EuroGeographics, Eurostat, the Office of the United Nations High Commissioner for Refugees (UNHCR), the Organisation for Economic Co-operation and Development (OECD), UN-GGIM: Europe, UNECE, the World Bank Group, and Esri. Such broad representation and expertise really made the event such a success and the organizers are very grateful for the efforts that participants made to attend the workshop and the (sometimes considerable) distances that were travelled to get there.

C. Workshop overview

44. The workshop was designed to focus on the sharing of innovative and best practices, as well as on lessons learned, and on the integration of statistical and geospatial data at both national and international levels. The workshop sessions focused on specific areas that were identified through the UNECE Survey and were clustered around three main themes: Effective Governance, Data and Technology, and People and Partnerships. These themes aligned with the strategic pathways and broader areas of influence of UN-IGIF.

45. The workshop was formally opened by the director of the Republic Geodetic Authority, Mr. Borko Drašković, and the director of the Statistical Office of the Republic of Serbia, Mr. Miladin Kovačević, who both highlighted the benefits of integrating statistical and geospatial information and emphasized the strong cooperation in place between the two agencies, particularly noting the success of the population census which took place last year and the ongoing agricultural census. Leading representatives from the joint organizing bodies, UNECE, Eurostat and UN-GGIM: Europe, also addressed the participants, sharing their perspectives on the importance of data integration activities across the region and their hopes for the future.

1. Session 1: Effective Governance

46. This session was chaired by Mr. James Norris, International Policy Lead at Ordnance Survey (United Kingdom) and chair of the UN-GGIM: Europe Working Group on the Integrated Geospatial Information Framework. The session focused on the roles, remits and key activities of the main international and regional bodies and their cooperation in the field of data integration and highlighted important policy frameworks, including new developments within national contexts. Presentations were made by UNECE, Eurostat, UN-GGIM: Europe, the European Forum for Geography and Statistics, the National Land Survey of Finland, and Statistics Finland.

2. Session 2: Data and Technology

47. This session focused on best practices and innovations within the data integration life cycle and due to the popularity of this theme, the session was divided into two sub-sessions. Session 2.1 was dedicated to the design, production and analysis stages of the data life cycle and was chaired by Ms. Carol Agius, Head of Representation and Stakeholder Engagement at EuroGeographics and UN-GGIM: Europe Secretariat. In this session, presenters from the

World Bank Group, the Statistical Office of the Slovak Republic, the Central Statistics Office in Ireland, Statistics Portugal, TurkStat and the Republic Geodetic Authority shared great examples of use cases and best practice on topics such as stratified sampling designs, census data pathways, territorial typologies, linked data, geographies of demand and access, and digital transformation through data integration.

48. Session 2.2 focused on visualization, dissemination and web technologies and was chaired by Mr. Taeke Gjaltema, Regional Advisor for Statistics at UNECE. Presenters from the Agency for Statistics of Bosnia and Herzegovina, OECD, Esri, Statistics Sweden, and Statistics Portugal shared their expertise on effective visualization techniques for thematic mapping, showcased useful tools for data-driven decision-making at the municipal level, highlighted the value of enterprise-level geospatial platforms across the data life cycle including new innovations for SDMX integration, discussed the benefits of fundamental data domains to promote the harmonization and interoperability of data, and the value of web technologies to enhance research capabilities for public policymakers. Great examples of National Spatial Data Infrastructures were also presented by the State Service of Ukraine for Geodesy, Cartography and Cadastre and the State Authority for Geospatial Information in Albania who showcased their value for data integration activities to promote synergies and collaboration at national levels.

3. Session 3: People and Partnerships

49. This session was chaired by Ms. Márta Nagy-Rothengass, Deputy Director of Sectoral and Regional Statistics and Head of the Regional Statistics and Geographical Information Unit at Eurostat. This session focused on capacity-development initiatives and presenters from the Federal Statistical Office in Switzerland, UN-GGIM: Europe's Working Group on Data Integration and the Agency of Land Relations of the Republic of Moldova showcased examples of successful partnerships to advance the integration of geospatial and statistical information.

4. Interactive activities

50. Over the course of the workshop, there were many opportunities for networking and discussion during the breaks and through a series of interactive activities which were designed to help stimulate engagement and collaboration amongst participants to generate ideas and new ways of thinking on specific topics relating to the workshop sessions. Through small group discussions, some great outcomes were generated by the groups on how to optimize current governance and policy frameworks, identify the skills needed to progress data integration activities, determine the best ways to communicate and engage with key stakeholders in the field, and identify the key building blocks needed to form successful and sustainable partnerships both now and in the future.

VII. Some final thoughts

51. Through the activities undertaken by UNECE under the EU-funded project to develop greater capacity in the integration of statistical and geospatial information, the stage has been set for organizations across the region to work together to overcome common challenges, lay the building blocks to greater data integration, and together harness the true benefits that integrated and harmonized data can bring to society. Now, we must act and maintain momentum to reach a brighter, more data-driven future.