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Status of integration of geospatial and statistical information in Africa

I. Introduction

1. The interest in and use of geospatial data by governments, companies and the public is growing and has led to the creation of national spatial data infrastructure, which is driven by data and metadata standards. Statistical agencies are focusing on connecting statistical and geographical data, and the knowledge and application of frameworks for that connection have proved to be important for expanding interoperability.

2. The Economic Commission for Africa (ECA) is working to integrate geospatial information and statistics, which, until now, has been missing in the development of the geospatial information management information chain. ECA has a working group on the integration of geography and statistics under the auspices of the Regional Committee of United Nations Global Geospatial Information Management for Africa. In addition, *Geospatial Information for Sustainable Development in Africa: African Action Plan on Global Geospatial Information Management 2016–2030* is aimed at developing the link between geography and statistics for sustainable development in Africa.

3. The use of geocoding in the geospatial field is mainly limited, first, to national spatial data infrastructure and a small number of national statistical frameworks that integrate geography into the statistical production process. Geographic listing by national statistical offices has been limited to population and housing censuses, which can restrict the usefulness of data disclosure when combining enumeration and dissemination geographies.

4. The second and third most common forms of geocoding are national registries and address coding, respectively. Those techniques offer extremely exact and adaptable geocodes through location and geographic codes for small areas. Data captured from the Global Positioning System is increasingly being used in the field of statistics.

5. Most countries use administrative borders at the subnational level as the main geographic boundaries for collecting data on population distribution. Those boundaries can change, however, which can affect comparisons over time. Other geographic types, such as geographic listings, statistical geographies based on function, and postal and grid-based geographies, are used for collecting data on smaller areas.

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6. Over the years, African countries have separately developed their respective national spatial data infrastructure and national strategies for the development of statistics, which are aimed at producing high-quality spatial and statistical data. Both processes were being conducted without using the Global Statistical Geospatial Framework, which was created to link those two processes together and with other efforts.

7. The present report includes an examination of the increasing use of geospatial data in Africa and the efforts to integrate them with statistical information. African countries have developed national spatial data infrastructure and national strategies for statistics, but challenges remain in achieving effective collaboration among data-driven organizations. The report includes examples of how geospatial technology has been used in censuses and surveys to geocode housing unit locations and digital enumeration area maps, and a description of the principles of the Global Statistical Geospatial Framework and how they have been implemented in various censuses and surveys in African countries. The report underscores the importance of integrating geospatial and statistical information in Africa and of the efforts being made in that regard.

8. The objectives of the report are, among others:

(a) To highlight the increasing interest in, and capacity to use, geospatial data for practical purposes of governments, companies and the public, with a specific focus on African countries;

(b) To identify the challenges and opportunities in integrating geospatial and statistical information, and the efforts being made to address those challenges;

(c) To discuss the development of national spatial data infrastructure and national strategies for the development of statistics in African countries, and the need for a national statistical geospatial framework to achieve effective collaboration among national data-driven organizations;

(d) To provide examples of how geospatial technology has been used in population and housing censuses and surveys in African countries to geocode housing unit locations and digital enumeration area maps;

(e) To identify the principles of the Global Statistical Geospatial Framework and how they have been implemented in various censuses and surveys in African countries;

(f) To highlight the critical importance of integrating geospatial and statistical information for sustainable development in Africa.

9. Overall, the report is aimed at providing a comprehensive overview of the status of the integration of geospatial and statistical information in Africa, the current challenges in that regard and the opportunities available to address those challenges.

II. Rationale for the Global Statistical Geospatial Framework

10. The Committee of Experts on Global Geospatial Information Management has identified the linking of geospatial data with socioeconomic and other data, or the integration of geospatial and statistical information, as a critical issue that must be tackled as a priority, owing to the large number of national geospatial information authorities and international organizations that are affected by that issue.

11. Recognizing the critical need to incorporate geography into statistics, in 2013, the Statistical Commission and the Committee of Experts established the Expert Group on the Integration of Statistical and Geospatial Information. The Expert Group was tasked with developing and advancing the implementation of the Global Statistical Geospatial Framework. The critical need for integration was also recognized in 2017, when the Statistical Commission adopted the Cape Town Global

Action Plan for Sustainable Development Data.[2] Objective 3.4 of the Action Plan is to "integrate geospatial data into statistical production programmes at all levels", and the key action of the objective is to "promote the integration of modern geospatial information management systems within mainstream statistical production programmes by highlighting synergies between the two systems".

12. African countries prioritize the integration of statistical and geospatial data in order to measure policy effectiveness and promote sustainable development. Accordingly, the Regional Committee has established a working group to develop an African action plan on geospatial and statistical information integration.

III. Developing a national statistical geospatial framework

13. A national statistical geospatial framework should include a description of the policy principles that guide national statistical offices, geospatial information authorities and, possibly, other national data-driven organizations in their work to tackle the challenges relating to the appropriate use of geospatially enabled statistics, and the effective collaboration among those entities in the development of a common data infrastructure and interoperable systems.

14. A review of ongoing national spatial data infrastructure initiatives has been conducted, supported and assisted by ECA and its partners. In addition, desk reviews of the process and national strategies that relate to the development of statistics have been conducted by ECA. Those efforts have involved studying documents from countries that have completed their statistical and geospatial development strategies and are in the process of, or are about to commence, implementation. In accordance with their terms of reference, the reviews are aimed at determining which approach should be adopted in integrating national strategies for the development of statistics and national spatial data infrastructure across Africa.

IV. Integration of geospatial and statistical information in Africa

15. There has been progress in the integration of geospatial and statistical information in Africa, in particular as part of censuses and surveys. Countries have geocoded housing unit locations and geographic boundary files for statistical reporting units. Vector layers containing feature data, such as landmarks, roads, schools, hospitals and clinics, are being included in censuses and surveys. Geocoding has provided avenues for gazetteers, which contain geographic coordinates for all population settlements and other important geographic features in a given country.

16. Some national statistical offices have developed a spatial geographic database, with polygonal and attribute information for their national enumeration areas (the units into which a territory is divided, and which are allocated to canvassers during a census). A common digital base can assist with the censuses of agriculture and population. Census data have been released at the enumeration-area level or aggregated into new small-area dissemination units, such as population clusters.

17. In addition, some statistical offices have developed a library of digital administrative boundaries, ranging from the provincial to the municipal levels, and, in some cases, the land-parcel level; deployed digital census atlases and dynamic atlases; and used spatial analysis techniques.

18. An assessment of the data derived from the database of the Statistics Division of the United Nations Secretariat on censuses undertaken in Africa during the 1990, 2000, 2010 and 2020 rounds and of the geocoding of data sets for spatial analysis of variables that has been applied in the Demographic and Health Survey reveals that

[2] Available at https://unstats.un.org/sdgs/hlg/Cape-Town-Global-Action-Plan/.

progress in the implementation of the Global Statistical Geospatial Framework has varied among countries and across principles.[3]

19. By December 2021, 45 countries were actively using geospatial infrastructure and geocoding, across various cartography formats, for population and housing censuses, and 31 countries were mainstreaming digital census cartography. Only five countries, however, had implemented fully digital census cartography and census processes, including analysis and dissemination. An increasing number of countries were implementing the framework to make statistics readily accessible and usable.

20. Geospatial infrastructure and geocoded variables have been used by 45 countries for the Demographic and Health Survey, and 38 African countries have made use of a spatial data repository for that Survey. There has been at least some interoperability between statistical and geospatial data and in the promotion of accessible and usable geospatially enabled statistics in 30 countries in relation to the Survey.

V. Principles of the Global Statistical Geospatial Framework

A. Principle 1: use of fundamental geospatial infrastructure and geocoding

21. All African countries have recognized the importance of using relevant and authoritative geospatial data and services to produce statistical content, which contributes to decision-making processes and policy formulation. Harnessing geospatial data is central to tackling many development challenges facing the continent, including urban planning, natural resource management, disaster mitigation and the achievement of the Sustainable Development Goals. Many countries on the continent, however, are struggling to establish viable infrastructure that is linked with their national strategies for the development of statistics. It is important to collect, enhance, improve and provide reference data through the national spatial data infrastructure, and to prioritize fundamental data sets, such as addresses, buildings and cadastral parcels. Recommendations made by the Regional Committee should be implemented to facilitate the integration of geospatial and statistical information.

22. The roles and responsibilities of the various agencies involved in the production of geospatial information, including the determination of the agency that should maintain information, what that information should be and how often data are updated, must be clearly defined. Models for custodianship and stewardship may need to be established to identify the most relevant stakeholder for a given geospatial data source. Those models should be implemented by mapping and statistical institutions.

23. Countries should adopt point-based geocoding as the main and preferred geocoding approach. The use of more general location descriptions or larger geographies, such as enumeration areas or other statistical geographies, should be considered only as a complementary or secondary approach for when point-based geocoding fails because of partially missing data. African countries should agree on the infrastructure, which would be uniform across the continent, to geocode all public and, potentially, private data. In order to implement a point-based foundation for statistics, authoritative information on physical address locations, buildings and cadastral parcels should be made available within the national spatial data infrastructure. In addition, information must be accurate and consistent, have sufficient coverage and meet internationally and nationally agreed standards. It is

[3] For more information on the population and housing censuses and the Demographic and Health Survey, see https://unstats.un.org/unsd/demographic-social/census/ and https://dhsprogram.com/Methodology/GIS.cfm, respectively.

essential that the point-based geocoding approach be adopted by national mapping agencies and national statistical offices.

24. All countries should have a single, national, authoritative and universal address registry that is open to public institutions. National mapping agencies should provide national geocoding services based on authoritative location data, and those services should be accessible by other countries. Collaboration among national statistical offices and national mapping agencies is essential for the successful integration of geography and statistics. The reference data needed for geocoding statistical information should be collected, enhanced, improved and provided through the national spatial data infrastructure. The specifications set out by the Regional Committee concerning fundamental data sets should be applied to facilitate the integration of geospatial and statistical information.

25. National statistical offices and national mapping agencies should work together to increase knowledge exchange through training, information-sharing and cooperation on projects. Agreements should cover the access to, and the licensing, governance and use of, geospatial information. Collaboration is encouraged in Africa through the working group on the integration of geography and statistics. The working group should facilitate and monitor knowledge-sharing between the geospatial and statistical communities.

B. Principle 2: geocoded unit record data in a data management environment

26. To manage data effectively while maintaining privacy, it is important to link statistical and geographic objects at the unit-record level. Implementing data warehouse solutions can help to integrate geocoded microdata into a structured data architecture with privacy safeguards. Location data objects should be properly incorporated into the data architecture of national statistical offices. Geocoding databases should include references to relevant administrative and statistical geographies. If point references are not available, statistical microdata should include a minimum reference of 1 square kilometre.

27. Countries should establish and implement standards for national geocoding processes to guarantee consistency within and across institutions. For instance, there should be an agreement on the location data that providers should use to geoenable certain statistics, and process standards should contain mutually agreed techniques to enhance unit location matching. A thorough analysis of country circumstances and practices is required to achieve those goals. Geocoding standards should be adopted at the continental level to guarantee coherence and interoperability.

28. Accurate and consistent geocoding information is important and point-of-entry validation methods should be used to ensure the high quality of location references in administrative and statistical records. The Regional Committee recommends that the statistical and geospatial communities should work together to encourage the use of authoritative location data by government entities. Legal measures should be explored to ensure the quality of data. National mapping agencies should have custodial responsibility over boundary data for administrative geographies, whereas national statistical offices should have custodial responsibility over coding systems for statistical geographies.

C. Principle 3: common geographies for the dissemination of statistics

29. Principle 3 emphasizes the importance of providing authoritative geospatial data for the production and distribution of official statistics, the need for complete and consistent data sets and collaboration between national mapping agencies and statistical offices to enhance the access to and the usefulness of national data. The

possibility of linking and openly distributing data on statistical and administrative geographies should be explored.

30. A continuous framework for national statistical and administrative geographies should prioritize current data, but it should also include historical geographies because they are essential for recasting current, or point-based, data onto previous administrative or statistical divisions. National mapping agencies and national statistical offices should agree on a scale, the reference dates and the correctness of administrative and statistical geographies using the basic data sets provided by the Regional Committee and the recommendations that have been made as part of the second administrative level boundaries programme. Boundary precision is required for data collection, analysis and processing, but simplified geometries at a generic level are desirable for the purposes of distribution and visualization.

31. The procedures and basic building blocks for creating and mapping the lowest national administrative layer and any data coverage issues should be clearly defined and correctly documented in the metadata. In addition to statistical geographies, countries should offer area statistics on the size of those geographies using a harmonized methodology and national data. Land area statistics are essential for density data, such as those relating to population density.

32. Coordination between national statistical offices and national mapping agencies in producing administrative units should be improved. When coding methods or borders change, the data on national statistical and administrative geographies should be accessible to all users no later than six months from the reference date.

33. African national mapping agencies are encouraged to provide a single access point for open national data on administrative geographies, cadastral parcels, addresses and buildings. It is recommended that national statistical offices be involved in drafting legislation that includes a requirement for the regular and frequent generation of population grids following the 2020 census round to update territorial typologies. Additional grid sizes should be explored and agreed upon at the continental level, in accordance with data interoperability standards for statistical units. The geospatial and statistical communities should prepare for the potential future deployment of the grid system for data at the national and continental levels.

D. Principle 4: statistical and geospatial interoperability

34. The statistical community should be more involved in the development of new geospatial standards and in increasing the usefulness of those standards for statistical output. To enhance interoperability, ECA, the United Nations Initiative on Global Geospatial Information Management and other bodies should establish a forum for cross-domain debate and participation. The production of geospatial statistics should be grounded in statistical models and standards, and current geospatial standards, for data collection and distribution.

35. Geospatial data and the notion of location must be considered as part of logical data warehousing and data architecture. There should be a greater emphasis in the Generic Statistical Business Process Model on the use of geographic data and techniques in the statistics production process. Geospatial services in a service-oriented architecture should be part of that process and, in that context, national statistical offices should share their tools.

36. Common conceptual frameworks for statistical and geographical items are needed in Africa. Data models for addresses and buildings, and their relationships, machine-readable open data formats for national geospatial statistics and the use of unified population grids for the 2020 round of population and housing censuses should all be developed. The Table Joining Service of the Open Geospatial Consortium is recommended for harmonizing African data. A standard for categorizing common geographies in a machine-readable, open data format is needed.

E. Principle 5: accessible and usable geospatially enabled statistics

37. African countries should aim to offer under open data licensing at least one core set of statistical variables, such as total population, for grids with a mid-resolution (i.e. of 1-square-kilometre) or other small areas. Geospatial statistics should be published on an open-source basis. The licence for geographic statistics should be as permissive as feasible, based on the open data licences for the aggregated source data. The data supplier should execute the respective licence information inclusion policy in relation to fees and access constraints, among other things.

38. African countries should investigate the use of service-oriented dissemination systems that provide more flexibility in the use of data and greater availability of data through application programming interfaces. Services and non-proprietary formats that are compliant with the Open Geospatial Consortium, such as GeoPackage for file delivery, should be used for dissemination to guarantee end-user flexibility. Countries should increase their efforts to facilitate a common conceptualization of, and shared solutions for, service-oriented and dynamic data linkage. In addition, best practices and existing accomplishments must be reinforced and used effectively to stimulate the integration of geography and statistics in Africa.

39. ECA recommends that national statistical offices and mapping agencies work together to promote statistics as a service, using open geospatial data standards and improving accessibility. African countries should adopt procedural guidelines for census data distribution and establish privacy standards for national grid data. They should also establish mechanisms for regular discussions with users of geospatial statistics and consider user-centred product design.

VI. Geocoding data from the 2020 census round

40. The focus of support for the 2020 census should shift towards using geospatial data for decision-making at the national level. The United Nations should encourage the sharing of geospatial census-related data for policymaking and advocacy and explore combining geospatial data with other sources of development data.

41. Mapping is an important part of the census process, and recent advances in technology have made mapping more efficient. There are challenges, however, with using digital mapping, and it is important to consider all aspects of data collection, processing, analysis, dissemination, evaluation and archiving when planning a census. A census based on geographic information systems should be planned and executed consistently and on schedule.

42. The failure of countries to implement the Global Statistical Geospatial Framework is a core problem, which has led to the ineffective use and geospatial analysis of census data. A user-friendly census would help government agencies, local governments, universities, research entities and corporations to access and understand census information easily. A census based on geographic information systems would expand the user population that is interested in statistics with a spatial dimension. Consultation with key users is necessary to determine the format and breadth of data to be distributed and to understand user expectations.

43. ECA must strengthen the capacity of national statistical organizations and census offices on the continent to manage geospatial data and develop a geocoding scheme for the geospatial analysis of 2022 census data. The objectives of ECA are to contribute to the coordination of census analysis by integrating the geospatial component into census analysis efforts; associating the geocoded data collected from census cartography with the analytical process, including by creating the architecture to link census cartography and analysis; developing a geocoding scheme for at least 13 thematic topics for census analysis; and establishing a geospatial dissemination strategy for census results using geospatial tools. Efforts in respect of those objectives were highlighted in a training workshop held in Douala, Cameroon, from 6 to 11 June

2022, on strengthening the efforts of the Central Bureau of Census and Population Studies of Cameroon to manage geospatial data and develop a geocoding scheme for the geospatial analysis of the data from the 2022 population and housing census. Advisory missions targeting several countries will be undertaken as part of efforts to support the implementation of the Global Statistical Geospatial Framework.

44. A regional workshop on geocoding population and housing census data in support of the 2020 census round took place on 24 and 25 October 2022, on the margins of the eighth meeting of the Statistical Commission for Africa, which was held in Addis Ababa from 24 to 26 October. During the workshop, an assessment was made of the implementation of the strategy for integrating statistical and geospatial information, and the geocoding of population and housing census data in Africa was introduced. Using the manual on geocoding census data in Africa as a reference document, the workshop provided a forum in which the use of the principles of the Global Statistical Geospatial Framework for integrating geography and statistics in Africa could be developed. The workshop was attended by over 80 participants, including delegates from 34 African countries,[4] and observers from international organizations, including ECA, the African Union Commission, the secretariat of the United Nations Initiative on Global Geospatial Information Management, academia, industry organizations and the private sector. The participants analysed a report on the status of the integration of geospatial and statistical information in Africa[5] and proposed recommendations for implementing the Global Statistical Geospatial Framework on the continent. In addition, the participants reviewed the manual on geocoding population and housing census data in Africa. The workshop was funded by the European Union, ECA and partners. The European Union and ECA sponsored 24 and 39 participants, respectively.

45. Technical assistance and advisory missions were undertaken in Burundi and Cameroon. The mission in Cameroon, which took place between 6 and 10 June 2022, was aimed at strengthening the Central Bureau of Census and Population Studies to manage geospatial data and develop a geocoding scheme for the geospatial analysis of the 2022 population and housing census data. The work of the mission was carried out within the framework of a national workshop, during which coordination efforts with critical stakeholders to reinforce the spatial analysis of census data were strengthened, and recommendations were made for the development of a strategy for the dissemination of census results using geospatial dashboards and other tools. During the mission, the geocoded data from census cartography was reviewed; strengths, weaknesses, opportunities and threats were analysed to determine the appropriate architecture to link census cartography and analysis; and a geocoding scheme was developed for thematic census analysis. The Central Bureau of Census and Population Studies and the United Nations Population Fund funded the workshop. The European Union sponsored the participation of the geospatial information system expert from ECA.

46. A scoping mission took place in Burundi from 5 to 10 September 2022, to identify ways to strengthen the efforts of the Institute of Statistics and Economic Studies of Burundi[6] in census cartography and geospatial data management, and to develop a geocoding scheme for the geospatial analysis of census data. The mission included a discussion of the cartographic strategy for the census, including the census cartographic strategy document; project management structures and training for the census mapping staff; quality assurance, control, sustainability, risk factors and methodology of the census; communication, publicity and advocacy plans; mapping operations and budgeting for mapping in the field; the update of the locality coding

[4] Algeria, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Comoros, Congo, Côte d'Ivoire, Egypt, Eswatini, Ethiopia, Ghana, Kenya, Lesotho, Madagascar, Malawi, Mali, Mauritania, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, South Africa, Sudan, Togo, Tunisia, Uganda, United Republic of Tanzania, Zambia and Zimbabwe.

[5] E/ECA/GGIM-A/8/2.

[6] On 16 November 2022, the name of the Institute was changed to the National Institute of Statistics of Burundi.

list and geocoding system; the spatial analysis of the census results; and the dissemination of the results. Participants in the mission made recommendations in all those thematic areas and general recommendations on the census organization and process.

47. A second mission was conducted in Burundi from 28 November to 9 December 2022. The objectives of the second mission were derived from the findings from the scoping mission, which were focused on technical and programmatic assistance for census cartography. The work was completed through a workshop sponsored by the United Nations Population Fund, and it resulted in the drafting of key documents, including manuals to guide the training of census office staff before, during and after the conduct of a census; a census cartographic strategy document; and a manual for cartographic agents.

48. The outcomes of the mission included recommendations to the Census Bureau of Burundi, the United Nations Population Fund and the Environmental Systems Research Institute (a geographic information system software company) on hardware, software, data and human resource requirements, as well as on sustainability, the institutional context, external and financial assistance, training, and technical, maintenance and methodology support. The mission was undertaken by two experts from ECA and their travel was funded by the European Union. A third mission took place in Burundi from 17 to 21 April 2023.

49. During the fifty-third meeting of the Governing Council of the African Regional Institute for Geospatial Information Science and Technology, held in Lagos, Nigeria, from 7 to 11 November 2022, the various activities implemented by ECA on the continent relating to the geocoding of census results were shared to stimulate their replication among the members of the Regional Institute,[7] and to increase awareness of the grant funding from the European Union among the members and the Governing Council, with a particular emphasis on geocoding as the foundation for linking statistics with geography.

50. ECA finalized a manual on geocoding, which provides guidelines for geocoding in Africa and an outline of best practices in assigning location data to addresses using geographic coordinates and describing the information associated with those coordinates. It includes information on common challenges and the importance of geocoding for emergency response, public health and urban planning. The manual is intended to be a resource for African countries and organizations looking to improve their geospatial data infrastructure.

51. ECA has finalized a compendium of data sources for monitoring climate change impacts in Africa. The compendium highlights the need for a comprehensive and accessible set of data sources to monitor and analyse the impact of climate change in Africa and is useful for policymakers, researchers and other stakeholders. Developing the compendium involves identifying relevant data sources, harmonizing data and ensuring data accuracy and accessibility. The objective of the compendium is to provide an evidence-based approach to addressing climate change challenges in Africa and promoting sustainable development initiatives.

52. In addition, ECA has finalized a compendium on making urbanization work for Africa. The document is a guide on using geospatial data sources to map and monitor urbanization in Africa. It includes reliable data sources and is aimed at helping urban planners and policymakers to make informed decisions about managing urban growth and development in Africa.

[7] The members of the African Regional Institute for Geospatial Information Science and Technology are Benin, Burkina Faso, Cameroon, Ghana, Mali, the Niger, Nigeria and Senegal. Côte-d'Ivoire, Guinea-Bissau and Liberia recently joined the organization.

VII. Enhancing the implementation of the Global Statistical Geospatial Framework at the national level

53. In addition to the technical and methodological recommendations concerning the principles of the Global Statistical Geospatial Framework, the following recommendations relating to the governance of the Framework in Africa and the process for its implementation should be considered:

(a) African countries should formally adopt a methodology for implementing the Framework through the Regional Committee mechanism for providing support to countries working on statistical-geospatial integration in Africa;

(b) African countries should work in partnership with ECA and the Regional Committee in firm agreement and with a clear mandate to execute the provisions of the Framework;

(c) The working group on the integration of geography and statistics should provide continuous guidance on the implementation of the Framework, with a view to achieving the goal of improving the integration of statistical and geographical information, with reference to other important methodological frameworks, such as the Generic Statistical Business Process Model and the Common Statistical Production Architecture;

(d) The strategy for the implementation of the Global Statistical Geospatial Framework that has been developed for Africa should be the official authorized road map, under which milestones and priorities should be established and specific proposals for implementation should be consolidated. That road map must be supported by the geospatial and statistical communities at the national and global levels collectively because of the intersectoral nature of the strategy’s application;

(e) The concepts outlined above must be developed further through the collaborative efforts of various stakeholders, including those in the statistical and geospatial communities, before they can be applied in a harmonious way. Some of the following areas should be considered: feasibility testing of requirements in the current production process; an exploration of national benchmarking; an examination of the ways in which process and operational tools work; and training facilitation;

(f) The implementation of the Global Statistical Geospatial Framework must be thoroughly and continuously monitored throughout Africa. A methodology should be developed to assess the performance of national statistical offices and national mapping agencies in fulfilling the requirements of the Framework.