# United Nations Expert Group on the Integration of Statistical and Geospatial Information

Background Document on

## Proposal for a Global Statistical Geospatial Framework

(Advanced Draft as of 28/07/2016)

# Contents

## Executive Summary

This paper proposes a Global Statistical Geospatial Framework and puts forward the five high-level principles in the Framework for endorsement by the international statistical and geospatial communities – as represented by the UN Statistical Commission (UNSC) and United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM). It also highlights the ongoing work by the UN Expert Group on the Integration of Statistical and Geospatial Information (UN EG-ISGI) to pursue areas of further detail to permit consolidation and implementation of the Global Framework. Once complete, this detail will be brought to the UNSC and UN-GGIM for consideration.

The UN EG-ISGI was established by the UNSC and UN-GGIM with a mandate to develop an international statistical geospatial framework. The Global Forum on the Integration of Statistical and Geospatial Information, convened in New York in August 2014, identified that "there is an urgent need for a mechanism, such as a global statistical-spatial framework, to facilitate consistent production and integration approaches for geo-statistical information."[1]

The UN EG-ISGI agree that the Global Statistical Geospatial Framework will provide a common method for geospatially enabling statistical and administrative data, as well as ensuring that this data can be integrated with geospatial information. This will enable:

- new, better and more integrated information for analysis and decision making processes;
- comparisons within and between countries in a more harmonised manner;
- increased information on smaller geographic areas[2];
- the development of common tools/applications to support the integration and sharing of data;
- commercial development of geospatial tools that will further support data integration; and,
- generally more efficient production of information.

The Global Statistical Geospatial Framework comes at an important time as statistical and geospatial agencies work to modernise and transform their models of operation and infrastructure. The Global Framework will also be critical to support the work occurring on the 2020 Round of Population Censuses and the 2030 Agenda for Sustainable Development.

The principles based Framework presented in this paper has evolved from Australia's Statistical Spatial Framework and has been guided by a global consultation process. In the final international consultation there has been a large and overwhelmingly positive response from over 40 member states. In many cases joint or separate submissions were received from both National Geospatial Information Authorities (NGIAs) and the National Statistical Offices (NSOs). Where comments have been provided by member states during consultation, they have been considered and modifications have been made to this proposal and aspects of the Global Statistical Geospatial Framework.

[1] http://ggim.un.org/docs/meetings/Global%20Forum/Summary-report%20of%20the%20Global%20Forum.pdf

[2] *For the purpose of this paper, the terms "geographies" and "geographic areas" will be used to describe a broad range of geographic areas or regions that define places, from small to large areas.*

**The five high-level principles of the Global Statistical Geospatial Framework**

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| Principle 1: Use of fundamental geospatial infrastructure and geocoding. |
| Principle 2: Geocoded unit record data in a data management environment. |
| Principle 3: Common geographies for dissemination of statistics. |
| Principle 4: Statistical and geospatial interoperability – Data, Standards and Processes. |
| Principle 5: Accessible and usable geospatially enabled statistics. |

The usefulness of these high-level principles and Global Framework more generally has already been demonstrated by the adoption of these principles by a number of countries, each at different starting points in their statistical and geospatial infrastructure development (e.g. Mexico, New Zealand, United Arab Emirates, and Egypt), as well as strong interest from regions, such as Europe. Many member states responding to the international consultation also identified their desire to implement the Framework within their national circumstances. These principles also lay a strong foundation on which detailed guidance can be built to support the integration of statistical and geospatial information and facilitate the consolidation and implementation of the Global Framework; a process that has already been started by the Expert Group.

These high-level principles reflect best practice in the statistical and geospatial arenas and their development has strengthened the partnerships between these communities. The endorsement of the Global Statistical Geospatial Framework principles will represent a significant achievement by the UN-GGIM in the early years of its functioning.

The Expert Group recommends the UN-GGIM adopt and the UNSC endorse the five high-level principles of the Global Statistical Geospatial Framework and continue to support the work program of the UN EGISGI to develop detailed guidance around these principles.

# Proposal for a Global Statistical Geospatial Framework – Full Paper

## Background

At the forty-fourth session of the United Nations Statistical Commission, held in February 2013, the Statistical Commission discussed the Programme Review: "Developing a statistical-spatial framework in national statistical systems". In making decision 44/101, the Statistical Commission adopted the proposal to establish an Expert Group to develop an international statistical geospatial framework, taking into account existing national and international efforts.

The third session of the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM), held in July 2013, acknowledged the importance of integrating geospatial information with statistics. The Committee of Experts made decision 3/107 supporting the Statistical Commission's decision to establish an Expert Group and for it to undertake work developing a statistical geospatial framework as a global high-level framework for the integration of statistical and geospatial information.

At the first meeting of the United Nations Expert Group on the Integration of Statistical and Geospatial Information (UN EG-ISGI), held 30 October – 1 November 2013, the Expert Group discussed and agreed on a Terms of Reference. The Terms of Reference were subsequently endorsed by the United Nations Statistical Commission and the United Nations Committee of Experts on Global Geospatial Information Management.

The Expert Group Terms of Reference includes the following as a focus area:

> *"Evaluate the statistical-geospatial framework developed by the Australian Bureau of Statistics, and determine if and how this could be internationalised".*

At the second meeting of the Expert Group, held on 24 May 2015 in Lisbon, Portugal, participants discussed options to prepare a global statistical geospatial framework for endorsement.

- The Statistical Spatial Framework (SSF) developed by Australia was reviewed.
- Mexico's National Geostatistical Framework was presented.
- The European Forum for Geography and Statistics (EFGS)/Eurostat work on the application of the Generic Statistical Business Process Model (GSBPM) to geospatial information was also considered.

It was agreed that:

- The Statistical Spatial Framework developed by Australia is a high-level framework that permits the application of the Framework principles to the local circumstance of individual countries.
- The practical application of the principles in countries such as Mexico provides a powerful demonstration of the benefits of these principles.
- The extension of the GSBPM model to the integration of geospatial information into the statistical production process provides a link to internationally agreed statistical processes and facilitates the communication between the statistical and the geospatial communities.

The third meeting of the UN EG-ISGI was held in April 2016 in Paris on the margins of the Conference of European Statisticians.[3] The Expert Group provided final comments on an advanced draft of the proposal for a Global Statistical Geospatial Framework (this document). The expert group agreed that the proposal would be moved to the global consultation phase and that the Global Framework would then be submitted to the UN Committee of Experts on Global Geospatial Information Management in 2016, and the UN Statistical Commission in early 2017 for adoption. It also sought to clarify future plans for the consolidation of material that would support the Framework and promote and support its implementation in global initiatives such as the global indicator framework for the Sustainable Development Goals (SDGs) and the UN 2020 Round of Population Censuses.

### UN EG-ISGI Work Programme

The Expert Group agreed to a work programme item to prepare a Global Statistical Geospatial Framework incorporating aspects of the three models (discussed above). Australia agreed to undertake this work programme item and bring together these three models as the basis for a proposal for a Global Statistical Geospatial Framework.

The United Nations Statistical Division (UNSD) agreed it would then undertake a global consultation, with the intent of submitting a Global Statistical Geospatial Framework to the Committee of Experts and Statistical Commission in 2017 for adoption.

## Context

It is now readily accepted that integrating statistical and geospatial information is critical for:

- local, sub-national, national, regional, and global decision making processes;
- measuring and monitoring the targets and global indicator framework for the Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development;
- supporting data sharing between institutions and enhancing the interoperability of geospatial and statistical information;
- unlocking new insights and data relationships that would not have been possible by analysing socio-economic, environmental or geospatial data in isolation of each other;
- promoting investment and capability building in geospatial and statistical information;
- building institutional collaboration between geospatial and statistical communities; and,
- examining new sources of data that includes geospatial information, for example mobile phone data.

The challenge now is "how best to achieve this integration in an effective and consistent way"[4]. The Global Forum on the Integration of Statistical and Geospatial Information, convened in New York in August 2014, identified that "there is an urgent need for a mechanism, such as a global statistical-spatial framework, to facilitate consistent production and integration approaches for geo-statistical information."[5]

[3] http://ggim.un.org/docs/meetings/3rd%20UN-EG-ISGI/EG-ISGI-Third%20Meeting-Summary-Paris.pdf
[4] http://unstats.un.org/unsd/statcom/doc13/2013-2-ProgReview-E.pdf
[5] http://ggim.un.org/docs/meetings/Global%20Forum/Summary-report%20of%20the%20Global%20Forum.pdf

The Expert Group considers the best way to achieve consistent integration is through having a common method of geospatially enabling statistical and administrative data and integrating this with geospatial information through an internationally agreed framework (refer to Appendix 1 for further details on geospatially enabling data).

This will enable:

- new, better and more integrated information for analysis and decision making processes;
- comparisons within and between countries in a more harmonised manner;
- increased information on smaller geographic areas[6];
- the development of common tools/applications to support the integration and sharing of data;
- commercial development of geospatial tools that will further support data integration; and,
- generally more efficient production of information.

For National Statistical Organisations (NSOs) efforts to improve the integration of statistical and geospatial information occurs in an environment where NSOs are seeking to collectively modernise their statistical productions systems and processes, to transform their operations and to derive new relevant metrics and indicators for statistical purposes. Critically this includes the introduction of standards based, metadata driven infrastructure and processes.

For National Geospatial Information Authorities (NGIAs) this work occurs at a time where there is a collective effort and will to enhance the management and use of geospatial information. This includes efforts to specify the fundamental or core geospatial datasets that are required to support geospatial activities within nations and for international efforts; for example, to support reporting against the Sustainable Development Goals. These fundamental datasets are part of national geospatial infrastructures, which supports the geocoding of statistics and includes administrative and statistical geographies that support the integration of statistical information with geospatial information.

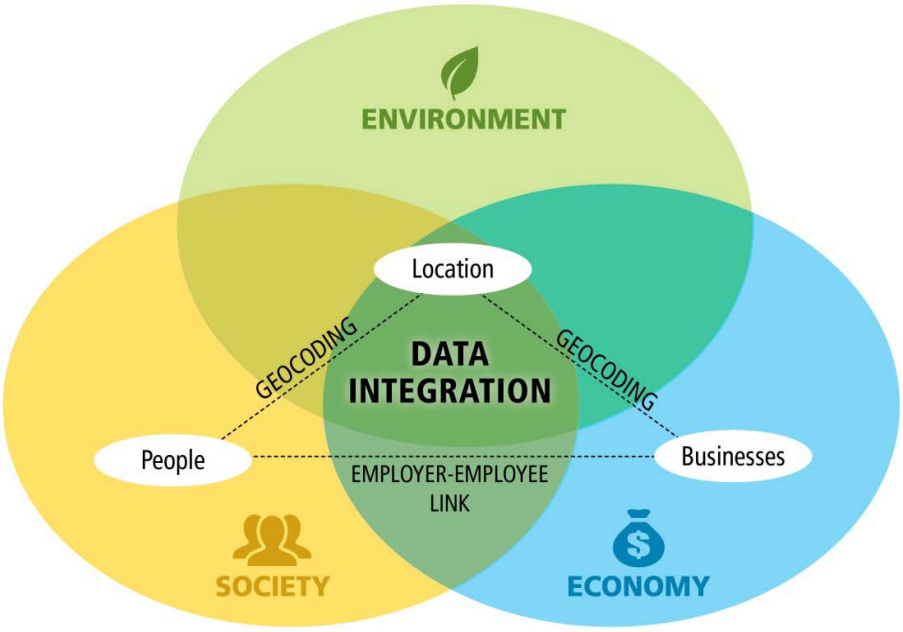
## The Global Statistical Geospatial Framework

The international statistical and geospatial communities have recognised the challenge of better integration of geospatial and statistical information and have responded by endorsing the United Nations Expert Group on the Integration of Statistical and Geospatial Information (UN EG-ISGI) to develop a Global Statistical Geospatial Framework. The Global Framework acts as a bridge between statistics and geospatial information, between NSOs and NGIAs, and between statistical and geospatial standards, methods, workflows, and tools.

[6] *For the purpose of this paper, the words and terms "geographies" and "geographic areas" will be used to generically describe a broad range of geographic areas or regions that define places, from small to large areas.*

The Global Framework provides the international community with a common approach to connecting people-centric information (socio-economic and environmental data) to a location, and improves the accessibility and usability of this geospatially-enabled data. Figure 1 highlights the importance of location information as an integrating tool between the three domains: society, the economy and the environment.

**Figure 1: Location as a link between society, the economy and the environment**



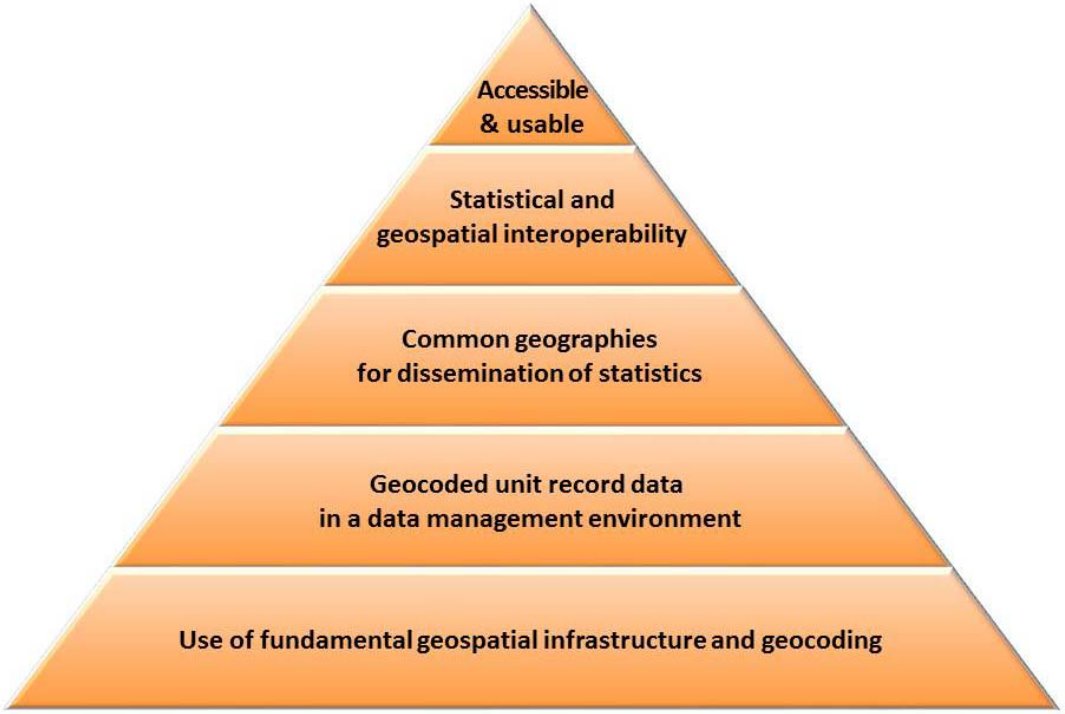

At this point in time, the Global Statistical Geospatial Framework focuses on the socio-economic and environmental statistical data traditionally produced by NSOs. The UN EG-ISGI will monitor the scope of the Framework with a review point in 2019. The intention of the Expert Group is for the Framework to be inclusive of all statistical and geospatial data, and to enable and encourage NSOs to look beyond traditional data sources and methods.

The Global Framework also provides an important communication tool and a common platform for the international community to discuss and understand the geospatial capabilities requirements for statistical information. This has been a vital element in the journey towards integrating geospatial capability in statistical transformation and modernisation efforts, and in development efforts in many national statistical systems. It has also provided the mechanism to connect statistical information into the efforts to improve geospatial information management globally, regionally and nationally.

## What is the Global Statistical Geospatial Framework?

The Global Statistical Geospatial Framework is a high-level framework that consists of five broad principles that are considered essential for integrating geospatial and statistical information (see the orange layers in Figure 2 below).

**Figure 2: Global Statistical Geospatial Framework**




## The Global Statistical Geospatial Framework Principles – Goals and Objectives

Each of the high-level principles in the Global Statistical Geospatial Framework are defined by a set of goals and objectives, and are supported by international, regional and applicable domestic standards and best practice. These principles and the associated goals and objectives are discussed below. The standards and best practice that will form the detailed guidance for countries implementing the Global Framework are still under consideration by the Expert Group and will be brought to the UNSC and UN-GGIM for consideration when finalised. These are listed for information in Appendix 2.

Where standards, policies or datasets required to support the Framework do not currently exist, the Global Framework provides a clear mandate for their establishment. Collaboration between countries and within the United Nations Expert Group on the Integration of Statistical and Geospatial Information provides a mechanism to assist with the formation and establishment of these standards, policies or fundamental datasets – both within member states and internationally. A number of areas of further work have been identified (some through consultation on this paper) and are under consideration by the Expert Group. These are listed in Appendix 3.

Case studies from Australia and a range of other countries, included in Appendix 4, show how international, regional and domestic standards can be applied in the context of this Framework.

## Principle 1: Use of fundamental geospatial infrastructure and geocoding

The Global Framework requires a common and consistent approach to establishing the location and a geocode for each unit in a dataset, such as a person, household, business, building or parcel/unit of land. A corresponding record of the relevant time or date for each instance of location information recorded should also be associated with each unit record.

The goal of this principle is to obtain a high quality, standardised physical address, property or building identifier, or other location description, in order to assign accurate coordinates and/or a small geographic area or standard grid reference to each statistical unit (i.e. at the microdata level). Time and date stamping these locations will place the unit both in time and in space. An alternative approach to geocoding for recording location is to use direct or indirect capture of coordinates (e.g. from GPS and maps respectively) from field work. Where this level of precision is not possible using current geospatial and statistical infrastructure within a country, adaptations using more general location descriptions and/or larger geographies will be necessary.

The Expert Group notes that geocoding statistical units using point referencing is highly preferable when compared to only associating statistical units with a geographic region (i.e. a polygon). The use of point referencing allows for considerable adaptability to changes in geographic regions over time or to adapt to new geographies that emerge. Where an established point based geospatial infrastructure does not exist in a country it is recommended countries test the implementation of point-based referencing for unit record data.

The process of obtaining locations and geocodes should use relevant, fundamental geospatial data[7] from National Spatial Data Infrastructures or other nationally agreed sources. These processes are generally referred to as geocoding, which is defined in detail in Appendix 1.

To ensure that all statistical data are consistently geospatially enabled using these methods the following objectives should be met:

- Address, property, building, and location information are accurate and consistent, meeting nationally agreed standards.
- Geocoding results are as accurate and consistent as possible.
- Consistent management of any geocoding issues through application of standardised approaches.

The Expert Group have identified a range of international and national standards, frameworks, infrastructure, and best practice that are relevant to this principle. Their potential uses in support of this principle are outlined in Appendix 3.

[7] http://ggim.un.org/docs/meetings/GGIM5/E-C20-2015-%20Fundamental%20Data%20Themes%20Report.pdf

## Principle 2: Geocoded unit record data in a data management environment

The Global Framework recommends that the linkage of a geocode for each statistical unit record in a dataset (i.e. a person, household, business, building or parcel/unit of land) occur within a data management environment. Persistent storage of a high precision geocode enables any geographic context to be applied when preparing the data for release in the future (i.e. in aggregating data into a variety of larger geographic units or to adapt to changes in geographies over time). Moreover, geocodes can enable data linking processes that aim to integrate information of varying nature and sources.

This component of the Global Framework also recommends that established data management tools, techniques and standards be used to facilitate the integration and management of the geocode within the dataset, including address to geocode linking mechanisms. This will ensure that all statistical data is consistently geospatially enabled and that the following objectives are met:

- Consistent and interpretable geocode information.
- Simplified aggregation of data for larger geographies through storage of an identifier or code for a small area geography or standard grid square for each unit record.
- Adaptation to changes to existing geographies or to allow compilation of data for new geographies (while also being conscious of the consequential confidentiality risks associated with differencing).
- Enable the flexible use of geocoded unit records in future analysis and visualisation.
- Effective data management, including protection of privacy and compilation of metadata.
- Clear maintenance and custodianship roles.

The Expert Group have identified a range of international and national standards, frameworks, infrastructure, and best practice that are relevant to this principle. Their potential uses in support of this principle are outlined in Appendix 2.

## Principle 3: Common geographies for dissemination of statistics

To enable comparisons across datasets from different sources, the Global Statistical Geospatial Framework recommends that a common set of geographies be used for the display, reporting and analysis of social, economic and environmental information.

The UN EG-ISGI recognises the importance of traditional statistical and administrative geographies. The Expert Group also recommends NSOs consider the benefits of gridded data. Gridded data can be both a rich source of information and a consistent geography for disseminating and integrating information. At the second meeting of the UN EG-ISGI in Lisbon, Portugal in May 2015 the USA presented on the advantages and disadvantages of grid-based and population and administrative

geography approaches[8]. Recent global efforts have culminated in the development of a Discrete Global Grid Systems (DGGS) standard which has been developed under the auspices of Open Geospatial Consortium (OGC). This System offers further options in the use of grids within the context of the principle of common geographies and in geospatially enabled statistics.

Use of a common set of geographies will ensure that all statistical data is consistently geospatially enabled and that users can discover, access, integrate, analyse and visualise statistical information seamlessly for geographies of interest. This will allow the following objectives to be met:

- Data from disparate sources can be integrated using common geography.
- Visualisation and analysis is simplified.
- Metadata supports data integration and use.
- Conversion of data between geographies is supported, through standard conversion mechanisms (e.g. correspondences[9]).

The Expert Group have identified a range of international and national standards, frameworks, infrastructure, and best practice that are relevant to this principle. Their potential uses in support of this principle are outlined in Appendix 2.

## Principle 4: Statistical and geospatial interoperability – Data, Standards and Processes

Both the statistical and geospatial data communities operate their own general data models and metadata capabilities; however, often these are not universally applied. The statistical community use the Generic Statistical Information Model (GSIM), the Statistical Data and Metadata Exchange (SDMX), and Data Documentation Initiative (DDI) mechanisms. The geospatial community use the General Feature Model (GFM) and developed the ISO19115 metadata standard, plus a number of application specific standards.[10]

The Expert Group recognises the benefits of greater interoperability between statistical and geospatial data and metadata standards, from cataloguing to data interchange. Overcoming structural and syntactic barriers between data and metadata from different communities and providers will enhance the efficiency of discovery, access, and use of geospatially enabled data. The Expert Group has noted that a number of initiatives have started internationally on these topics and encourages these efforts, while emphasising the importance of harmonisation across this work.

[8] http://ggim.un.org/2nd_Mtg_Expert-Group_ISGI_Lisbon.html
[9] For more information on correspondence methods see: http://www.abs.gov.au/websitedbs/D3310114.nsf/home/Correspondences
[10] For a discussion on these statistical and geospatial models and metadata standards, see: http://ggim.un.org/docs/meetings/2nd%20UN-EG-ISGI/Metadata%20interoperability%20cover%20paper%20EG-ISGI%202015.pdf and http://ggim.un.org/docs/meetings/2nd%20UN-EG-ISGI/Connecting%20Geographic%20and%20Statistical%20Information%20Standards%20EG-ISGI%202015.pdf

Within the statistical community there is a need to build geospatial processes and standards into statistical business processes in a more consistent manner. The Expert Group has recognised that, to ensure this occurs, a top down approach of incorporating geospatial frameworks, standards and processes more explicitly into the Common Statistical Production Architecture and its components is required. In particular, the General Statistical Business Process Model needs to make greater reference to the use of geospatial data and methods in the statistical production process, particularly the data, standards and methods that are incorporated into the Global Statistical Geospatial Framework. Eurostat through the GEOSTAT grant projects is funding the European Forum for Geography and Statistics to undertake research in this area, and progress is occurring (see Appendix 4).

By encouraging greater interoperability of statistical and geospatial data, standards and processes within the context of the Global Statistical Geospatial Framework the following objectives will be met:

- Greater efficiency and simplification of the creation, discovery, integration and use of geospatially enabled statistics and geospatial data.
- Increasing the potential application of a larger range of data and technologies.
- A wider range of data available and accessible for use in comparisons and analysis in decision making

The Expert Group have identified a range of international and national standards that are relevant to this principle. Their potential uses in support of this principle are outlined in Appendix 2.

## Principle 5: Accessible and usable geospatially enabled statistics

This component of the Global Framework emphasises the need to identify or, where required, develop policies, standards and guidelines that support the release, access, analysis and visualisation of geospatially enabled information.

These policies, standards and guidelines will highlight the wide range of legislative and operational issues that organisations need to be aware of when releasing and analysing information about people and businesses. One important aspect of this principle is to ensure data can be accessed using safe mechanisms that protect privacy and confidentiality but also enable access to data in order to undertake analysis that informs decision making. Other issues of relevance include: data quality in its different dimensions (particularly with regard to reliability, timeliness, and relevance), analysis, dissemination and visualisation.

This principle will ensure that custodians release data in appropriate forms and users can discover, access, integrate, analyse and visualise statistical information seamlessly for geographies of interest, thereby meeting the following objectives:

- Data custodians can release data with confidence, with privacy and confidentiality protected.
- Data users can discover and access geospatially enabled statistics.

- Data users can undertake analysis and visualisation.
- Web services enable machine-to-machine access, as well as dynamic linkage of information.

The Expert Group have identified a range of international and national standards, frameworks, infrastructure, and best practice that are relevant to this principle. Their potential uses in support of this principle are outlined in Appendix 2.

## Conclusion and Recommendations

The United Nations Statistical Commission (UNSC) and the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM) endorsed the development of a statistical geospatial framework for the integration of statistical and geospatial information. In support of the development of the framework, both intergovernmental entities endorsed the Terms of Reference for the Expert Group on the Integration of Statistical and Geospatial Information (UN EG-ISGI) with the following focus area:

> *"Evaluate the statistical-geospatial framework developed by the Australian Bureau of Statistics, and determine if and how this could be internationalised".*

The Expert Group has concluded that the Statistical Spatial Framework developed by the Australian Bureau of Statistics is a practical, principle based framework that is flexible enough to be customised to suit national contexts. This has been demonstrated by a number of countries applying this Framework (as outlined in Appendix 4) in their national contexts.

The Global Framework proposed in this document promotes the consistent geospatial enablement of statistical information so that it can be effectively integrated with data from national and international geospatial and statistical information infrastructures to support analysis and informed decision making. Moreover, this Framework provides an effective mechanism for the establishment of new statistics based on geospatial data, and the enhancement of existing geospatial-statistical production processes. This Framework is also a tool for encouraging research and discussion between geospatial and statistical communities, especially as institutions modernise and transform their infrastructure and technology.

To this end, the Expert Group on the Integration of Statistical and Geospatial Information proposes that the Global Statistical Geospatial Framework have the five broad principles shown below, and follow the Goals and Objectives detailed earlier in this paper.

**The five high-level principles of the Global Statistical Geospatial Framework**

| |
|---|
| Principle 1: Use of fundamental geospatial infrastructure and geocoding. |
| Principle 2: Geocoded unit record data in a data management environment. |
| Principle 3: Common geographies for dissemination of statistics. |
| Principle 4: Statistical and geospatial interoperability – Data, Standards and Processes. |
| Principle 5: Accessible and usable geospatially enabled statistics. |

## Topics for further work

The Expert Group recognises that there are a number of areas of detail that come under each of the high-level principles of the Global Framework, where further work is required. Pursuing global cooperation on these topics will ensure that:

- maximum benefit from the Global Statistical Geospatial Framework is realised;
- implementation of the Global Framework within countries and regions is simplified;
- fundamental national and international challenges in this area are addressed;
- knowledge and capability is shared globally; and
- collaboration and communication between the statistical and geospatial communities continues to be promoted.

The Expert Group have agreed on the following areas of detail that require further work:

- Application of the principles of the Framework to the development of statistical and geospatial information to support the global indicator framework for Sustainable Development Goals (SDGs).
- Build capability through the application of the Global Statistical Geospatial Framework and geospatial technologies to the 2020 Round of Population Censuses;
- Work to operationalise the principles of the Framework to ensure they are implemented and consolidated;
- Enhance collaboration and partnership between statistical and geospatial organisations;
- Work towards consistent terminology internationally and across communities;
- Protect confidentiality within statistics released for small geographic areas and across different geographies;
- Ensure data is interoperable between statistical and geospatial domains through connecting, extending and enhancing information (data and metadata) standards and information architectures (i.e. the Common Statistical Production Architecture and the General Statistical Business Process Model (GSBPM)), and the development and application of linked data methods;
- Investigate the application of statistical, administrative and grid geographies to data release and any issues associated with managing confidentiality and data comparability;
- Develop and share methods for ensuring effective and authoritative geocoding; and

- Contribute to the broader discussion on the use of Big Data in official statistics and geospatial information; for example, The United Nations Statistics Division Global Working Group on Big Data for Official Statistics[11].

A range of additional issues related to the Global Framework were identified during the consultation on this proposal document. These are listed in Appendix 3 and will be considered out of session and at forthcoming Expert Group meetings as part of the ongoing work program.

Having reached agreement on the broad principles of the Global Statistical Geospatial Framework and recommending it for adoption, the UN Expert Group on the Integration of Statistical and Geospatial Information can now focus on addressing these more detailed issues to ensure that further progress is made.

## Recommendations for adoption of Global Framework

### *Recommendation 1.A*

The United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM) adopt the high-level principles of the Global Statistical Geospatial Framework, acknowledging this as a significant achievement in partnership with the United Nations Statistical Commission (UNSC).

### *Recommendation 1.B*

The United Nations Statistical Commission (UNSC) endorse the high-level principles of the Global Statistical Geospatial Framework, acknowledging this as a significant achievement in partnership with the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM).

### *Recommendation 2*

The United Nations Statistical Commission and the United Nations Committee of Experts on Global Geospatial Information Management support the continuation of the UN Expert Group on the Integration of Statistical and Geospatial Information with a focus on:

- Consolidation and implementation of the Global Framework, including further work to expand on the areas of detail that come under each of the high-level principles;
- Increasing capability building across various dimensions of the Frameworks application;
- Enhancing knowledge management through case studies of implementation and adoption; and
- Interaction with existing, new and emerging global and regional bodies pursuing areas of detail that contributes to the consolidation and implementation of the Global Framework.

[11] http://unstats.un.org/unsd/bigdata/

# Appendix 1: Definitions

***Geocoding***

- For the purposes of the Global Statistical Geospatial Framework, geocoding is generally defined as the process of geospatially enabling statistical unit records so that they can be used in geospatial analysis.
- More specifically, geocoding is the process of *linking* unreferenced *location information* (e.g. an address), that is associated with a *statistical unit*, to a *geocode* (i.e. a geospatially referenced object); alternatively, the geocode can be directly incorporated into the statistical unit record.

    - *Geocodes* are, preferably, fine scale geospatially referenced objects that are stored as a geometry data type, such as: location coordinates (i.e. x, y, z coordinates) and/or small area geographies (e.g. mesh blocks, block faces or similar small building block geographies). Larger geographic units, such as enumeration geographies, can be used as geocodes where finer scale geospatial units are not available.

    - *Location information* can include addresses, property or building identifiers, as well as other location descriptions, such as enumeration geographies and other standardised (e.g. what3words reference) and non-standardised (e.g. village names) textual descriptions of a location.

    - *Statistical units* can include persons, households and living quarters, businesses, buildings or parcels/units of land.

    - *Linkage* of a geocode to a statistical unit record can occur through use of standard geographic coding systems, a Uniform Resource Identifier (URI) or through other computer based linkage mechanisms.

***Georeferencing***

- Georeferencing is a set of broad processes that includes *geocoding*. The following definition is included to aid understanding between the two terms.

Georeferencing, or geospatial referencing, is the process of referencing data against a known geospatial coordinate system, by matching to known points of reference in the coordinate system (e.g. image rectification to survey points or addresses linked to parcel centroids), so that the data can be viewed, processed, queried and analysed with other geographic data.

## Appendix 2: Relevant international and national standards, frameworks, infrastructure and best practice for the five Global Framework Principles.

### *Principle 1: Use of fundamental geospatial infrastructure and geocoding*

- The Global Geodetic Reference Frame, and aligned regional or national Geodetic Reference Frames.

- Fundamental geospatial data from the relevant National Spatial Data Infrastructure or other equivalent, nationally agreed geospatial data sources; in accordance with the Statement of Shared Guiding Principles for Geospatial Information Management[12].

- Nationally consistent address collection standards, to effectively capture the physical address; or location reporting standards, where standard addressing systems do not exist.

- Point-of-entry address or location validation (for computer and internet based capture), which will improve the quality of address and location information captured and the quality of the geocoding outputs. It will also reduce the time spent correcting addresses and locations provided by respondents.

- Adopting common and practical methods of address and location data capture as a key element of improving the quality of address and location information in administrative and collection based datasets.

- Implement common geocoding practices for statistical and administrative information; for example, use of common methods and infrastructure, such as national and regional geospatial reference systems based on fundamental or National Spatial Data Infrastructure datasets, including the use of national registers. It is expected that in many contexts these common practices may need to be developed.

### *Principle 2: Common geographies for dissemination of statistics*

- Agreed statistical and geospatial data management frameworks

- Geocoding metadata standards

- National privacy laws and/or agreed privacy standards, in accordance with the United National Fundamental Principles for Official Statistics

- Common geographic classifications

- Geospatial data management, including use of Global or national/regional Geodetic Reference Frames

12 http://ggim.un.org/docs/meetings/GGIM5/statement%20of%20shared%20guiding%20principles%20flyer.pdf

### *Principle 3: Common geographies for dissemination of statistics*

- Common geographic classification, including use of administrative and statistical geographies that are complemented by use of grid type geographies.
- Standards or guidance on the use of geographies for dissemination of data.
- International statistical and geospatial metadata standards.
- Systems and methods to correspond data between geographies.[13]
- National privacy laws and/or agreed privacy principles, in accordance with the United National Fundamental Principles for official Statistics.[14]

### *Principle 4: Statistical and Geospatial Interoperability – Data, Standards and Processes*

- As part of the Open Data initiative, the World Wide Web Consortium (W3C) has suggested Data Catalog Vocabulary (DCAT) as a standard supporting the discovery use case of all types of information. Specific application profiles of DCAT to geospatial information (GeoDCAT) and statistics (StatDCAT) are being developed which are interoperable with ISO19115 and SDMX respectively.[15]
- The OGC Table Joining Service (TJC) and INSPIRE directive also promote interoperable and metadata standards.

### *Principle 5: Accessible and usable geospatially enabled statistics*

- Where feasible adopt policies that maximise access to and use of open, free and unrestrictive geospatial information for innovation, efficient and effective decision making and a geospatially enabled society.[16]
- Standards or guidance on the use of geographies for dissemination, visualisation and analysis.
- Web service standards.
- National privacy laws and/or agreed privacy standards, in accordance with the United Nations Fundamental Principles for Official Statistics.

[13] For more information on correspondence methods see: http://www.abs.gov.au/websitedbs/D3310114.nsf/home/Correspondences
[14] http://unstats.un.org/unsd/dnss/gp/fundprinciples.aspx
[15] http://ggim.un.org/docs/meetings/2nd%20UN-EG-ISGI/UN-GGIM%20EG%20Lisbon%20meeting%20Session%206%20background%20paper%20Metadata%20DCAT.pdf
[16] http://ggim.un.org/docs/meetings/GGIM5/E-C20-2015-10%20Statement%20of%20Shared%20Principles%20Report.pdf

## Appendix 3: Areas of further work for consideration by the Expert Group

Potential areas of further work, identified during consultation on this paper, for consideration by the Expert Group.

- Further investigation into relevant standards and data models including CSPA, GSBPM, INSPIRE, and OGC standards.
- The potential role of linked data in geocoding, and geospatial and statistical data and metadata interoperability.
- Identify best practices for guaranteeing confidentiality, particularly when different sources and geospatial units are used for statistical data.
- Define data assets in a "service oriented architecture" construct, i.e. Certification, Registration, and Portfolio Management. This increases the ability to conduct lifecycle management of services and products, which also involves configuration/change management, as well as performance management and valuation.
- Develop "channel management standards", i.e. answer what are the expectations for data throughput from a variety of sources and networks. This helps shape capacity and demand management solutions, and optimises interface design at collection points, nodes, etc.
- Develop best practices for maintaining data over time, including version control, unique identifiers, and methods for tracking changes over time for geometries, and the associated statistical data, which is crucial for analyses of developments based on time series i.e. once an accurate, accessible, and useful framework is established, the data needs to be curated over time with requirements and standards applied to maintaining and updating the information.
- Work towards establishing the Global Statistical Geospatial Framework into a formal standard.
- Promote favourable access and use conditions for geospatial data relevant for geocoding and use within the context of framework purposes.
- Work to harmonise the geographic and geospatial objects used by the statistical and geospatial communities as their geographic reference framework.
- Work towards a full and smooth integration of the principles of the Global Framework in the General Statistical Business Process Model (GSBPM).
- Identify where there are synergies between the Global Framework and the Discrete Global Grid System (DGGS) to ensure efficient use of grid technology in the integration of data.
- Consult users of geospatially enabled statistics on their requirements in order to better assess the usefulness and effectiveness of the Global Framework from a user perspective.

# Appendix 4: Applying the Global Statistical Geospatial Framework

The principles of the Global Statistical Geospatial Framework are high level and flexible enough that they can be adapted and applied to a wide variety of country or regional contexts. By keeping the principles broad they can then be adapted to local circumstances, while still encouraging the use of international standards and methods.

Australia's Statistical Spatial Framework uses the same broad principles set out in the Global Framework. Information below on Australia's Statistical Spatial Framework shows how these principles have been applied in the Australian context.

In addition, other countries such as Mexico, New Zealand, Egypt and the United Arab Emirates have produced similar frameworks for their use nationally. The European Forum for Geography and Statistics (EFGS)/ Eurostat have also been working on applying the Generic Statistical Business Process Model (GSBPM) to managing geospatial information in the statistical production process. These examples will be explored further below.

## Country example - Australia

The Australian Bureau of Statistics (ABS) recognised some time ago the need for and challenge of better integration of geospatial and statistical information and responded by developing the Statistical Spatial Framework. This Framework provides Australia with a common approach to connecting people-centric (socio-economic) information to a location, and improves the accessibility and usability of geospatially-enabled statistics.

### *What is the Statistical Spatial Framework?*

The generic Statistical Spatial Framework, developed by the ABS, consists of five principles that are considered essential for integrating geospatial and socio-economic information (see green layers in diagram below). The Australian application of the Statistical Spatial Framework details the Australian implementation of the generic framework principles (see blue layers in Figure 6 below).

The Framework is also supported by international and Australian standards, and a range of guidance material; shown in Figure 7 on the following page.

**Figure 6: Australian Statistical Spatial Framework**

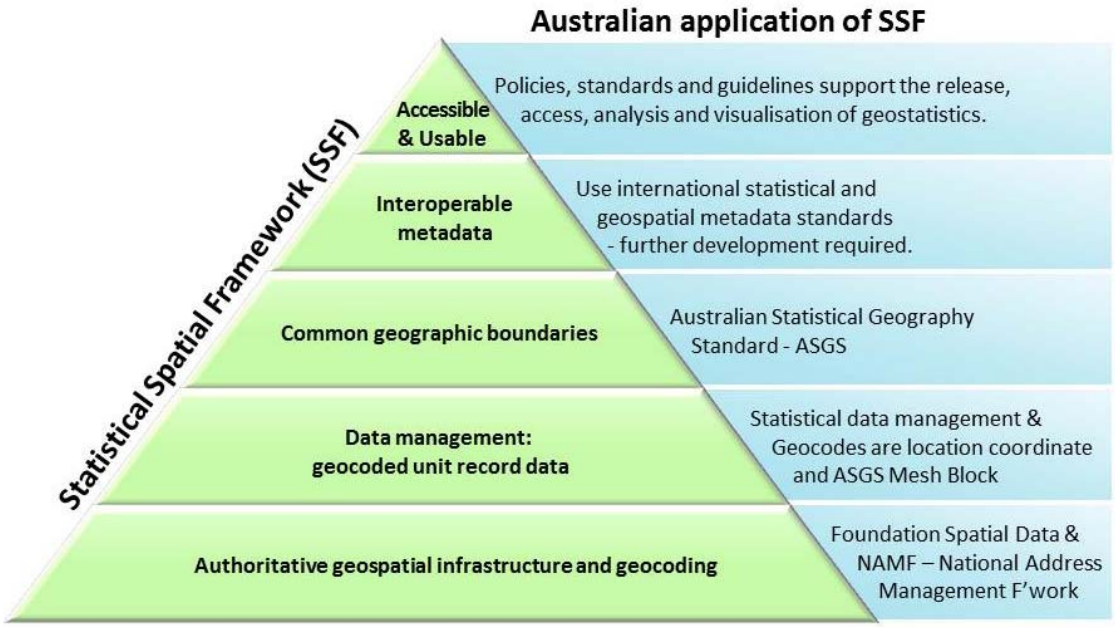
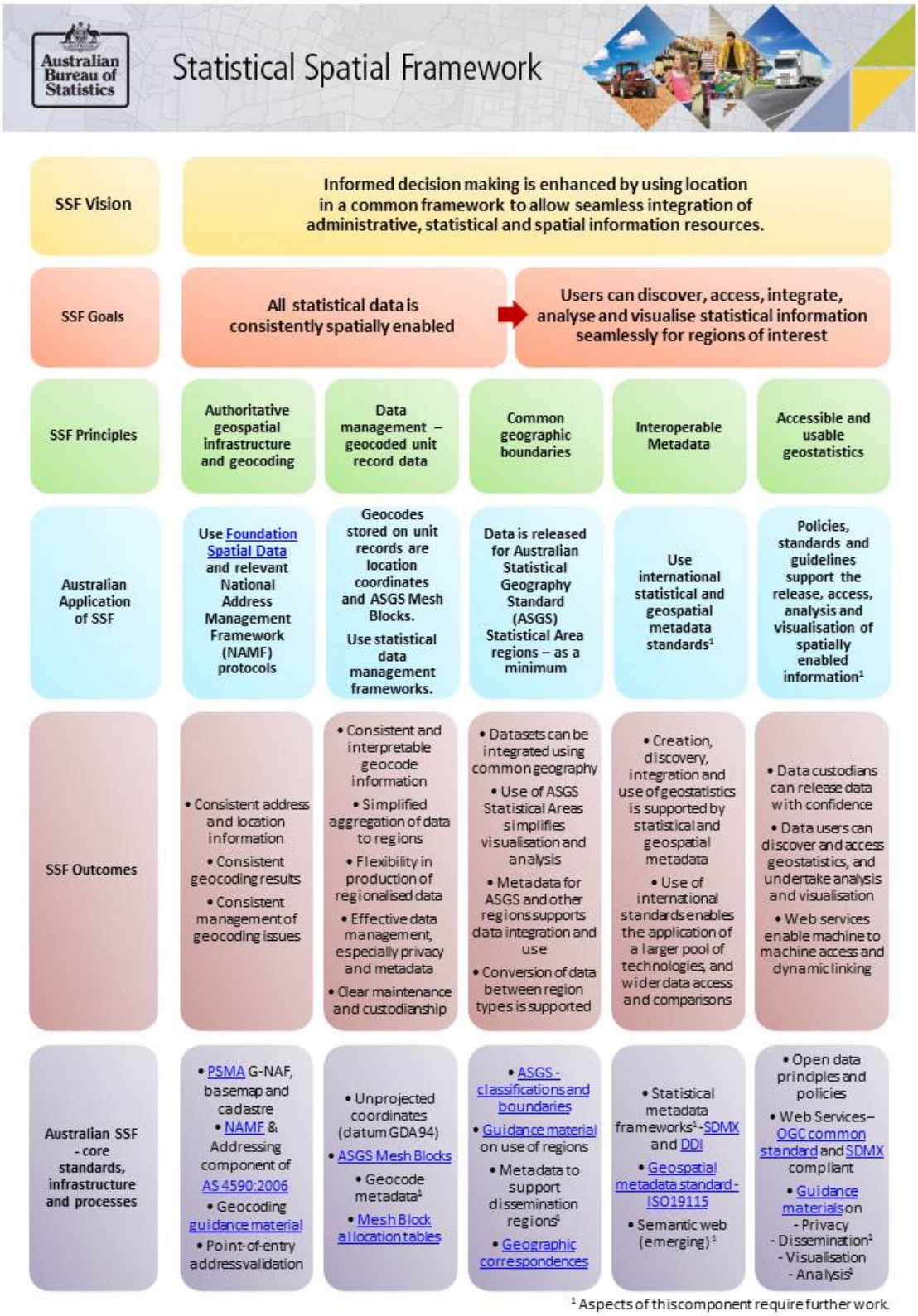


**Figure 7: SSF on a page**



### *Statistical Spatial Framework Principles – Goals, Objectives and Standards*

The Statistical Spatial Framework closely aligns with the Global Statistical Geospatial Framework discussed in this paper. In particular, both frameworks share common goals, objectives and standards. To illustrate how the Global Framework is able to be adapted to different national contexts, the information below shows how Australia applies a range of national and international standards, frameworks, best practice and infrastructure for each principle.

### *Authoritative geospatial infrastructure and geocoding*

- Authoritative geospatial data from the relevant National Spatial Data Infrastructure.

  *The Foundation Spatial Data Framework (FSDF) is the authoritative source of geospatial data for Australia.*

- Nationally consistent address collection standards to effectively capture the physical address.

  *Australia has the National Address Management Framework (NAMF) that provides a coordinated approach to address management and geocoding, and uses the AS 4590 address standard.*

- Point-of-entry address validation (for computer and internet based capture) will improve address quality and the resulting geocoding of information and also reduce the time spent correcting addresses after initial address data capture.

  *Point-of-entry address validation is rapidly becoming accepted as best practice in Australia and around the world; and the SSF promotes this practice.*

- Adopting common and practical methods of address data capture is seen as a key element of improving address data in administrative and collection based datasets.

  *The Australian Bureau of Statistics (ABS) is seeking to have simplified and standardised data capture fields incorporated into addressing standards, and these currently form part of the SSF guidance materials.*

- Common geocoding practice.

  *The SSF promotes common geocoding practice through its guidance material.*

### *Data Management*

- Agreed statistical and geospatial data management frameworks.

  *The ABS applies relevant National Statistical Organisation, as well as domestic and international, data management frameworks. The SSF promotes the use of the frameworks.*

- Geocoding metadata standards.

  *The SSF provides some guidance on the capture and storage of geocoding metadata; however, more comprehensive and internationally consistent standards are ultimately required.*

- National privacy laws and agreed privacy standards.

  *Australia has national privacy laws and principles that apply to the storage of data; the SSF promotes these laws and standards.*

- Common geographic classifications.

  *The ABS uses Mesh Blocks as a geocode type. Mesh Blocks are the smallest level of Geography in the Australian Statistical Geography Standard (ASGS).*

- Geospatial data storage and national Geodetic Reference Frame.

  *The current standard for the SSF is to store unprojected coordinates (datum GDA94).*

### *Common Geography*

- Common geographic classifications.

  *The ASGS is Australia's statistical standard for the release of socio-economic data geospatially; the SSF encourages its use for the release of socio-economic data by all custodians.*

- Accepted standards or guidance on the use of geographies for dissemination of data.

  *The ABS provides guidance on the use of geographies through the ASGS and through guidance material that supports the SSF.*

- International statistical and geospatial metadata standards.

  *The ABS applies relevant statistical and geospatial metadata standards, and the SSF promotes the use of these standards.*

- National privacy laws and agreed privacy standards.

  *Australia has national privacy laws and principles that apply to the release of data; the SSF promotes these laws and standards.*

- Systems and methods to correspond data between geographies.

  *The ABS produces correspondences allowing data to be converted between ASGS geographies and other geographies.*

***The SSF promotes the following ideal geographic classification principles:***

- *Has a hierarchical design.*
- *Supports flexible reporting by including a building block of small geographic areas, such as a suburban block, suburb or neighbourhood; which can then be aggregated to larger areas, such as natural resource management areas or larger administrative geographies.*
- *Is designed to include a hierarchy of geography types that contain approximately equal population numbers within each area of a geography type.*
- *Is stable over time.*

### *Statistical and Geospatial Metadata Interoperability*

- International statistical and geospatial metadata standards.

  *The ABS applies relevant statistical and geospatial metadata standards; however, there is currently an acknowledged gap in interoperability between these standards that needs to be addressed internationally. The SSF promotes the use of the existing standards.*

### *Accessible and usable Geostatistics*

- International principles or agreed national policies on open data.

  *The ABS applies relevant national open data policies and principles, and the SSF also promotes the use of these policies and principles.*

- Accepted standards or guidance on the use of *geographies* for dissemination, visualisation and analysis.

  *The ABS and the SSF promote the use of a range of resources for dissemination, visualisation and analysis of data, including UN resources.*

- Web service standards.

  *Open statistical/geospatial standards developed by the Open Geospatial Consortium (OGC) and Statistical Data and Metadata Exchange (SDMX) are promoted through the SSF.*

- National privacy laws and agreed privacy standards.

  *Australia has national privacy laws and principles that apply to the access and use of data; the SSF promotes these laws and standards.*

## Country example - Mexico

Mexico's National Geostatistical Framework is an example of a national system that geocodes statistical information from their censuses and surveys to a location and different levels of geography.

The National Geostatistical Framework aligns with the Global Statistical Geospatial Framework discussed in this paper. Following the example of the Australian application of the Statistical Spatial Framework, the information below shows how Mexico applies a range of national and international standards, frameworks, best practice and infrastructure for each principle.

### *Use of Fundamental geospatial infrastructure and geocoding*

- Authoritative geospatial data from the relevant National Spatial Data Infrastructure.

  *By law INEGI is the authoritative source of geospatial data used in Mexico for georeferencing statistical information.*

- Nationally consistent address collection standards to effectively capture the physical address.

  *Mexico has a Technical Standard to describe the home, based on the Geostatistical Framework for Mexico or the topographic map.*

- Adopting common and practical methods of address data capture is seen as a key element of improving address data in administrative and collection based datasets.

  *INEGI works with the various levels of government to advise on the adoption of the Technical Standard for Geographic Address for Mexico.*

- Common geocoding practice.

  *INEGI enables different levels of government to adopt the Technical Standard for Geographic Address.*

### *Geocoded unit record data in a data management environment*

- Agreed statistical and geospatial data management frameworks.

  *The Geostatistical Framework has been adopted across different levels of government for various administrative and statistical data analysis applications.*

- Geocoding metadata standards.

  *In Mexico the Geostatistical Framework is composed of catalogs for geocoding statistical data. Similar to the standards reported by Australia, Mexico seeks consistency with international standards.*

- National privacy laws and agreed privacy standards.

  *In Mexico there are a number of current laws that apply to personal information and INEGI has published several principles for statistical information.*

- Common geographic classifications.

  *In Mexico, according to the principles of confidentiality of statistical information, the most disaggregated level of information is the Block (for urban areas) and the Production Unit (for rural areas).*

- Geospatial data storage and national Geodetic Reference Frame.

  *The Geostatistical Framework is stored in Lambert Conformal Conic projection, using as a reference frame ITRF 2010 epoch 2008.0.*

### *Common geographies for dissemination of statistics*

- Common geographic classifications.

  *Currently in Mexico, all statistical information is linked to the Geostatistical Framework and it is based on the Geodetic Reference Framework that is used for all geospatial and environmental information, making it possible to link the statistics and geographical variables.*

- Accepted standards or guidance on the use of geographies for dissemination of data.

  *INEGI has standards and guidelines for the publication and dissemination of statistical and geographical information.*

- International statistical and geospatial metadata standards.

  *INEGI uses standards to prepare statistical and geographical metadata; these standards are used by other producers of statistics and geographic information.*

- National privacy laws and agreed privacy standards.

  *Mexico has federal laws for confidential data and INEGI has published standards for statistical and geospatial data.*

### *Interoperable data and metadata standards*

- International statistical and geospatial metadata standards.

  *INEGI applies standards for statistical and geospatial data. INEGI agrees with Australia on the need to seek international agreement.*

### *Accessible and usable geospatially enabled statistics*

- International principles or agreed national policies on open data.

  *INEGI applies principles and policies of open data and standards for the national interest.*

- Accepted standards or guidance on the use of *geographies* for dissemination, visualisation and analysis.

  *INEGI promotes mechanisms for dissemination, visualization and data analysis.*

- Web service standards.

  *INEGI promotes the adoption of open data based on the recommendations from OGC and SDMX.*

- National privacy laws and agreed privacy principals.

  *Mexico has laws on information security and INEGI has published the laws related to the statistical and geographical data.*

The diagrams on the following pages show how Mexico uses their National Geostatistical Framework.

## NATIONAL HOUSING INVENTORY

- 28’614,991 Housings (2010)

## ECONOMIC ESTABLISHMENTS

- Economic Units: 4’926, 061 (2014).

## SCHOOL CENSUSES

Workplaces:
- 236,973.

## DELIMITATION OF HUMAN SETTLEMENTS

- 2,969 Areas with colonies delimitation.
- 48,282 Colonies.

# GEOSTATISTICAL FRAMEWORK APLICATIONS

## METROPOLITAN AREAS

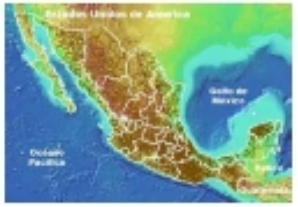
Three publications
- 2000 55 Metropolitan areas.
- 2005 56 Metropolitan areas.
- 2010 59 Metropolitan areas.


## GEOSTATISTICAL MAPPING

- 135,310 geostatistical products

## APPROVED CATALOGUE

- 32 AGEE
- 2457 AGEM
- 302,765 Geostatistical localities



# NATIONAL GEOSTATISTICAL FRAMEWORK DESEGREGATION CURRENT LEVELS

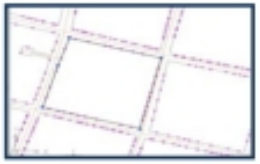

32 State Geostatistical Areas

2,457 Municipal Geostatiscal Areas

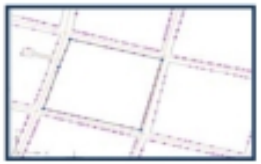
4,546 Geostatistical Urban Localities

49,681 Geostatistical Rural Localities


10'922,312 Total Roadways



1,451,922 Urban localities blocks



841,672 Rural localities blocks

38'010,866 Total Exterior Numbers

# PERMANENT UPDATING FRAMEWORK PROCESS

**SUPPLIES**
- Orthophotos with 1.0m resolution
- Satellite orthoimagery with 2.5m resolution
- Topographical information
- Geostatistical mapping

**NEW GROWTH IDENTIFICATION**

**NOMENCLATURE AND SERVICES UPDATE**

**AUTHORITIES VALIDATION**

**DIGITALIZATION AND GEOSTATISTICAL KEYS ASSIGNATION**

**MAPPING UPDATE**

**SIG MAINTENANCE**

## Country example - New Zealand

Statistics New Zealand's new Statistical Units Model is an example of a national system that geocodes statistical information from their censuses and surveys and produces statistics for different levels within a geography standard.

The Statistical Units Model aligns with the Global Statistical Geospatial Framework discussed in this paper. Following the examples from Australia and Mexico, the information below shows how New Zealand applies a range of national and international standards, frameworks, best practice and infrastructure for each principle.

### *Use of fundamental geospatial infrastructure and geocoding*

- Authoritative geospatial data from the relevant National Spatial Data Infrastructure.

  *The national cadastral database is the authoritative source of geospatial data for New Zealand. Legislation governs higher-level geographies for local governments and electoral purposes.*

- Nationally consistent address collection standards to effectively capture the physical address.

  *Different addressing standards exist to meet differing business needs. New Zealand has a Property Data Management Framework (conceptual model) and uses the AS/NZS 4819:2011 standard.*

- Point-of-entry address validation (for computer and internet based capture) will improve address quality and the resulting geocoding of information and also reduce the time spent correcting addresses after initial address data capture.

  *Point-of-entry address validation is desired but currently no address databases validate address at point-of-entry to an authoritative source.*

- Adopting common and practical methods of address data capture is seen as a key element of improving address data in administrative and collection based datasets.

  *A national address exchange standard is being developed. Statistics NZ and Land Information NZ are both currently implementing a New Zealand Profile of ISO 19160, an addressing exchange standard.*

- Common geocoding practice

  *Statistics NZ are creating a statistical frame and the supporting infrastructure to enable common geocoding practice. The 2013 Census of Population and Dwellings dwelling data has been geocoded to a location.*

### *Geocoded unit record data in a data management environment*

- Agreed statistical and geospatial data management frameworks.

*Statistics NZ applies relevant National Statistical Organisation, as well as domestic and international data management frameworks.*

- Geocoding metadata standards.

  *Statistics NZ has not implemented any geocoding metadata standards*

- National privacy laws and agreed privacy principles.

  *The Statistics Act 1975 governs Statistics NZ's approach to maintaining secrecy.*

- Common geographic classifications.
- *Statistics NZ currently uses the Meshblock as geocode type. Meshblocks are the smallest statistical spatial unit for statistical, electoral and government administration in New Zealand.* Geospatial data storage and national Geodetic Reference Frame.

  *Data is stored centrally in the New Zealand Transverse Mercator projection using the NZ geodetic datum 2000*

### *Common geographies for dissemination of statistics*

- Common geographic classifications.

  *The New Zealand Geographic Areas Classification 1992 is New Zealand's statistical standard for the release of socio-economic data geospatially. A Statistical Standard for Meshblock has been developed and a new Statistical Standard for Geographic Areas (SSGA) is in progress.*

- Accepted standards or guidance on the use of *geographies* for dissemination of data.

  *Statistics NZ disseminated limited data at Meshblock level and aggregates data to statistical, electoral and government administration areas. The SSGA will include standards and guidance for the use of statistical geography for the dissemination of data.*

- International statistical and geospatial metadata standards.

  *Statistics NZ uses the Australia New Zealand Spatial Information Council (ANZLIC [sic]) metadata profile to document geographic boundaries. This is an Australian/New Zealand Profile of AS/NZS ISO 19115:2005, Geographic information — Metadata (implemented using ISO/TS 19139:2007, Geographic information — Metadata — XML schema implementation).*

- National privacy laws and agreed privacy principles.

  *The Statistics Act 1975 governs Statistics NZ's approach to maintaining secrecy.*

- Systems and methods to correspond data between geographies.

*Statistics NZ produces concordances allowing data to be converted between Meshblock versions and all statistical, electoral and government administration areas.*

### *Interoperable data and metadata standards*

- International statistical and geospatial metadata standards.

  *Statistics NZ applies relevant statistical and geospatial metadata standards; however, there is currently an acknowledged gap in interoperability between these standards that needs to be addressed internationally.*

### *Accessible and usable geospatially enabled statistics*

- International principles or agreed national policies on open data.

  *Statistics NZ complies with the New Zealand Government Open Access and Licencing (NZGOAL) framework for data releases.*

- Accepted standards or guidance on the use of *geographies* for dissemination, visualisation and analysis.

  *Statistics NZ releases annual geographic classification, concordances and boundaries for use in dissemination, visualisation and analysis.*

- Web service standards.

  *Statistics NZ are providing open geospatial web services for some products as a prototype service.*

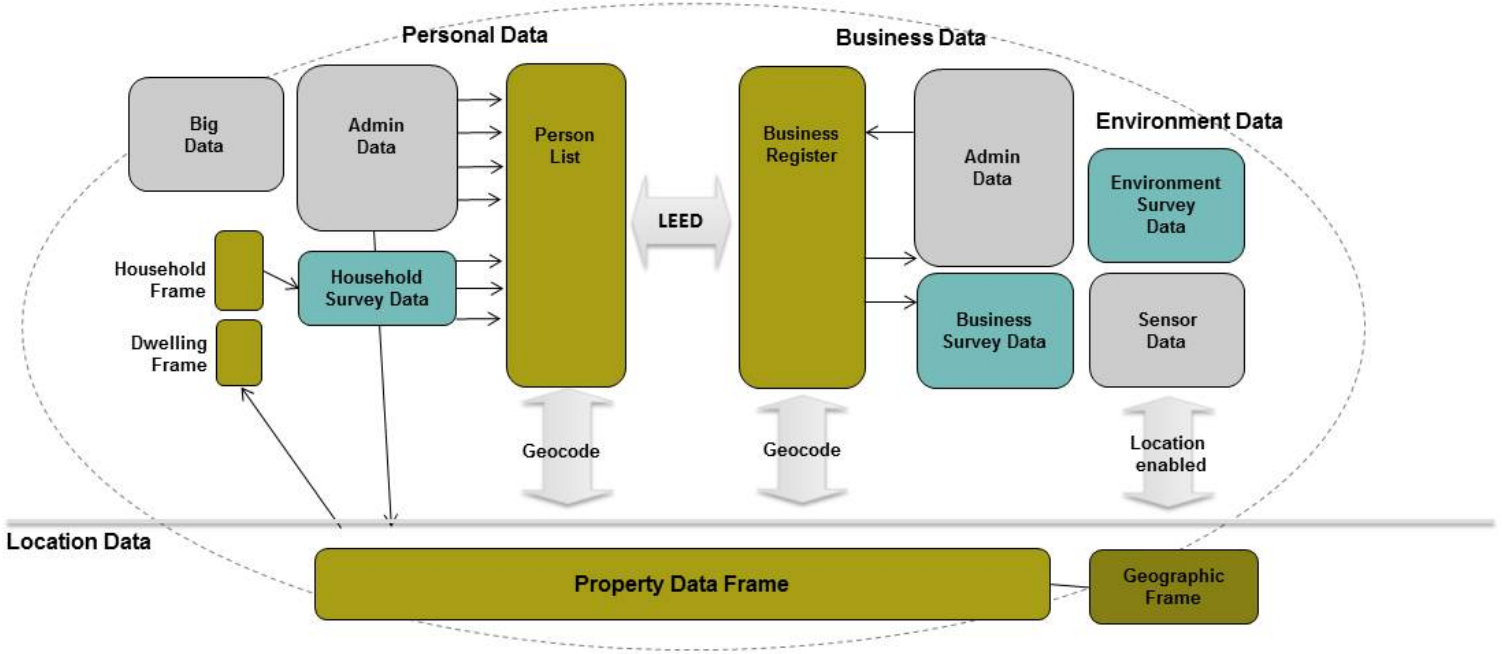
- National privacy laws and agreed privacy principles.

  *The Statistics Act 1975 governs Statistics NZ's approach to maintaining secrecy.*

The diagrams on the following pages show how Statistics New Zealand uses their Statistical Units Model.

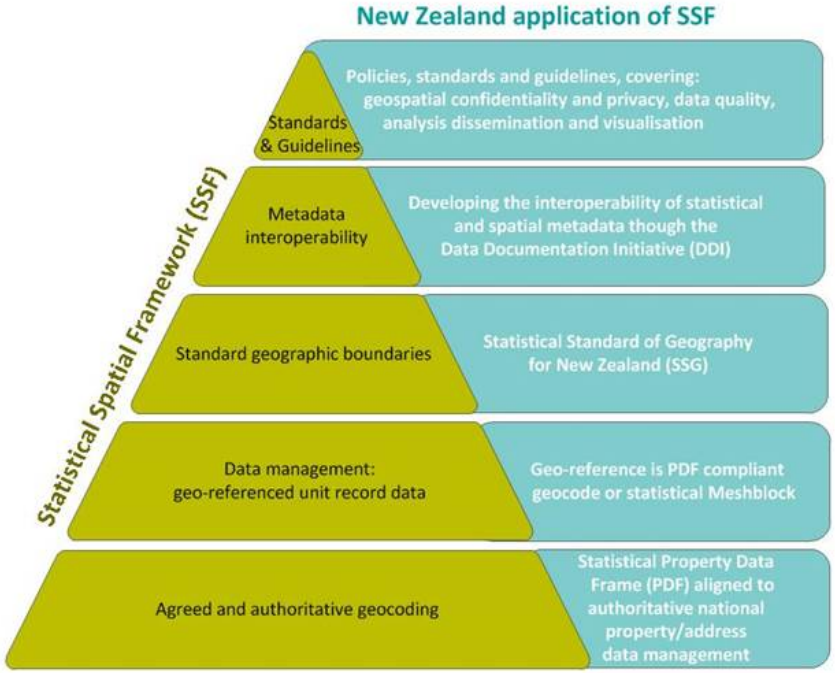
# Potential Future Statistical Units Model

- Geo-enabled statistical units model – linking data 'to' and by ' location



# Statistical Spatial Framework (SSF)

## *Integration of statistical & geospatial information*




- Geospatial infrastructure is in place
- Core geospatial capability
- Getting our house in order
- Building geo-statistical infrastructure – the elements of the SSF
- Collaborating with national mapping agency – taking a standards based approach

## Country example - Egypt

Egypt have also applied the principles in the Global Statistical Geospatial Framework to integrate statistical and geospatial information. Egypt is using the Framework to inform a range of activities being undertaken nationally that will enhance the integration of statistical and geospatial information.

### *Use of fundamental geospatial infrastructure and geocoding*

- Authoritative geospatial data from the relevant National Spatial Data Infrastructure.

  *Egypt is working on establishing a National Spatial Data Infrastructure using a National Grid system with coordinate system MTM-WGS84 (Modified Transverse Mercator), which will be used to generate a unique numbering and geocoding system for each unit in a dataset, such as a building, household or business.*

### *Geocoded unit record data in a data management environment*

- Geospatial data storage and national Geodetic Reference Frame.

  *All the geographical spatial data and statistical data in Egypt are identified with the smallest geographic boundary (Shyakha (Urban) - Village (Rural)). Egypt is currently working now on putting a mechanism in place to facilitate the integration and management of the geocode within a dataset including spatial number identifier to geocode linking mechanisms. This will join the detailed statistical building, household and business data. This will be accomplished by the end of the next census in 2016.*

### *Common geographies for dissemination of statistics*

- Common geographic classifications.

  *One of the most important roles of the National Spatial Data Infrastructure is to unify the administrative geographic boundaries between all the Egyptian agencies. It is also used as a mechanism for data dissemination using the National grid merged with the geographic boundaries.*

### *Interoperable data and metadata standards*

- International statistical and geospatial metadata standards.

  Egypt applies standards for statistical and geospatial data, and agrees with Australia on the need to seek international agreement.

### *Accessible and usable geospatially enabled statistics*

- International principles or agreed national policies on open data.

  Egypt uses open data policies and principles. After building and publishing the NSDI portal all the data will be accessed using Web services to enable dynamic access to the geostatistical data.

## Country example - United Arab Emirates

The United Arab Emirates' National Bureau of Statistics have also applied the Statistical Spatial Framework to integrate statistical and geospatial information. The following diagrams show how The United Arab Emirates are applying the SSF model.

# Statistical Geospatial Framework

**Statistical data sets** ⟷ **GeoSpatial Data Sets:**

Demographic and Social Statistics

**Social Statistics**
Health, Labor Force, Education, Security and Justice, Employment, Wages and Hours of Work

**Demographic**
Births and Deaths, Marriage and Divorce

**Censuses**
Population by Age Group and Urban/Rural

**Others …**

Economic Statistics

**Economic Sectors**
Foreign Trade Prices and Indices, National Accounts, Foreign Investment

Agricultural and Environmental Statistics

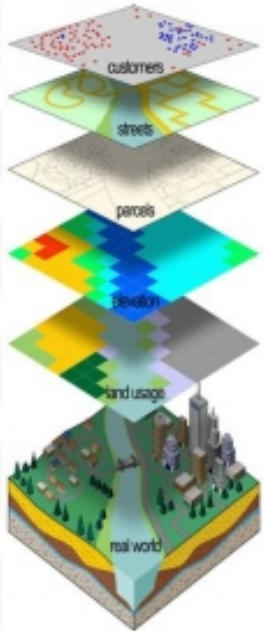
**Agriculture**
Crop, Livestock, Fisheries, Agricultural Economic

**Energy**

**Environment**
Waste, Climate, Water, Air

Geospatial Data Model

- Admin. & statistical boundaries
- Addressing, Place Names
- Transportation
- Land use and land Cover
- Elevation and Depth
- Imagery
- Topography



United Arab Emirates

# User needs

Statistical Information

Spatial Information

Statistical Spatial Framework

Health

Emergency Services

Policy Analysts

Natural Resources

Economics

Infra. and Transport

Local Government

Education

Land Admin

Academic Researchers

National Security

Agriculture

Business Intelligence

Human Services

# Impact on GSBPM

United Arab Emirates


## BEFORE

| TIME | RESOURCES | DATA |
|---|---|---|
| Weeks for small size samples | Multiple experts | MANY TABULAR FORMATS |
| Many months for large samples | Multiple QA/QC Specialists | PAPER MAPS AND DIGITAL MAPS |

## AFTER

| TIME | RESOURCES | DATA |
|---|---|---|
| FEW MINUTES | REGULAR USERS | Spatial central accurate and up to date datasets |

United Arab Emirates

# Statistical Geospatial Framework

## Standards & Guidelines

Policies, standards and guidelines, covering: confidentiality and privacy, data quality, analysis, dissemination and visualisation

## Metadata interoperability

Developing the interoperability of statistical and spatial metadata.

## Common geographic boundaries

U.A.E Statistical Geography Standard

## Agreed

## Data Management

## Authoritative

**Geocoding : unit record data**

Management Framework

## Country example - European Forum for Geography and Statistics

GEOSTAT 2 is a two year ESSnet (European Statistical System) grant project (2015-2016), being conducted by the EFGS with support from Eurostat, to foster a better integration of statistics and geospatial information in order for the statistical community to provide more qualified descriptions and analyses of society, economy and environment.[17]

Part of the work on this project includes developing a proposal to integrate geospatial information management into the Generic Statistical Business Process Model (GSBPM). This link to the GSBPM is not a replacement for the Global Statistical Geospatial Framework, but is important context for statisticians in the use of geospatial information in the statistical business process. Connecting the GSBPM and the Global Framework represents a process oriented, dynamic perspective on geospatially enabling statistics as an integrated part of the statistical production process. As such, incorporating the principles of the Global Framework into the GSBPM is a step towards its concrete implementation.

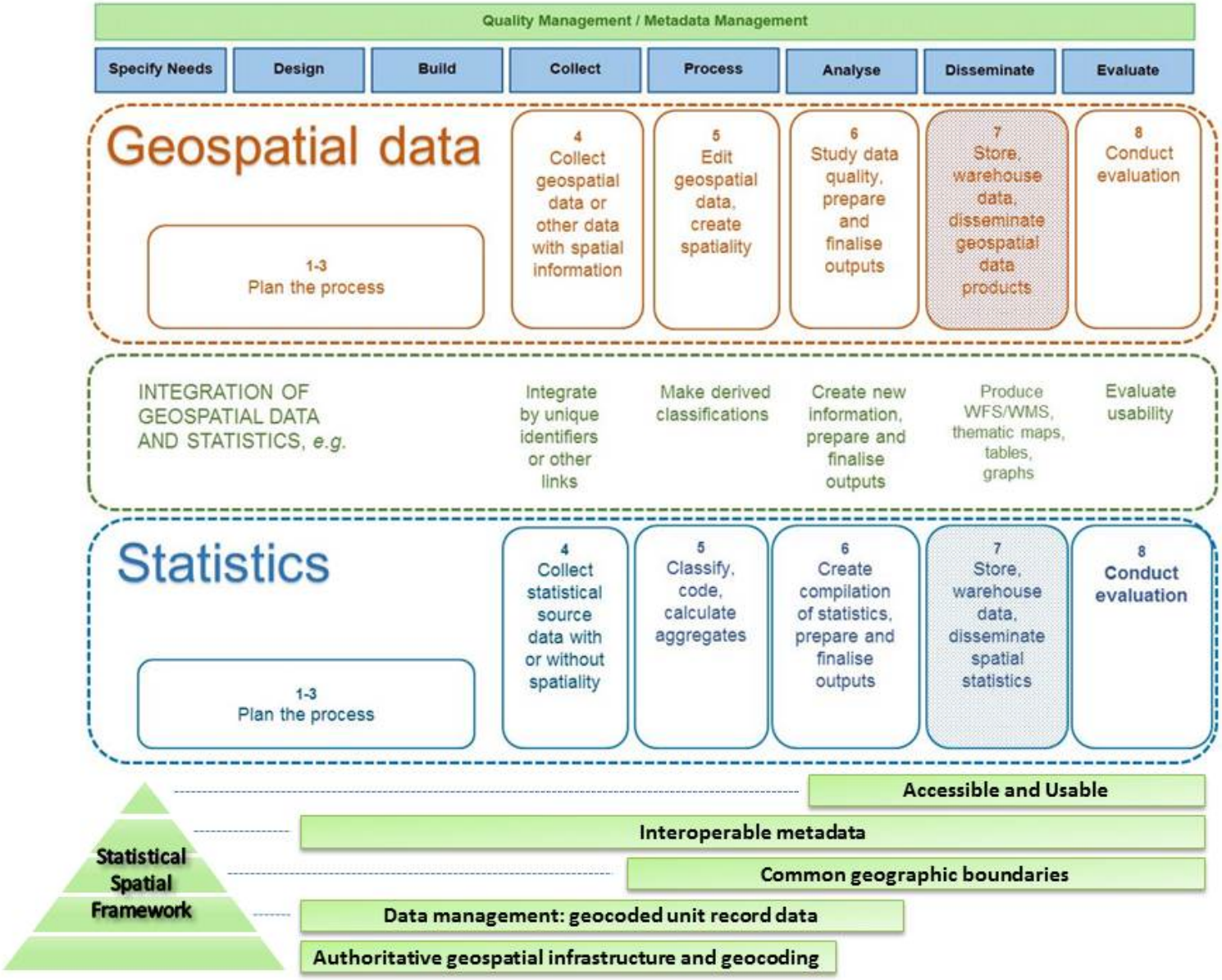
The diagram of a GSBPM based model for geospatial information prepared for GEOSTAT 2 is included below. This diagram shows the links between statistical and geospatial workflows and provides a link to internationally agreed statistical processes. The applicable elements of the Global Framework and their alignment with the GSBPM stages have been added to the bottom of the diagram for context.

Further work under GEOSTAT 2 regarding integration of geospatial information into the GSBPM is underway and more materials will be forthcoming as a result of this project and the follow-up project GEOSTAT 3 which will start in early 2017.

A major achievement for the availability of geospatial information needed for geocoding statistics in Europe is the INSPIRE Directive (Infrastructure for Spatial Information in the European Community): the legal framework that regulates geospatial information in European Union (EU). A number of INSPIRE Annex data themes are particularly relevant for the Statistical Geospatial Framework (SGF) such as such as Addresses, Geographical grid, Geographical names, Buildings, Population distribution and demography and Statistical units. The role of INPIRE will be specifically addressed in the European version of the Global Statistical Geospatial Framework, which is a subject for future developments within the GEOSTAT 3 project.

[17] http://www.efgs.info/geostat/2

## Production of Geospatial Statistics: An applied sketch of GSBPM and SSF linkages (EFGS – GEOSTAT 2, SSF adaption)




General Statistical Business Process Model: http://www1.unece.org/stat/platform/display/GSBPM/GSBPM+v5.0