

The status of Implementation of an Integrated Geospatial Data Management Framework in Dubai

Dr. AbdulAzaim Elniweiri Hassan¹ and Ms. Halima Alnaqbi²

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Summary

The Geographic Information Center Department (GISCD) of Dubai Municipality, on its track to be geospatial leader within the region as a strategic goal, has been engaged in establishing an Integrated Geospatial Data Framework (IGDF) that complies with the UN geospatial data management standards. The Integrated framework is seen by the Department to include all aspects of data governance, standards, and policies. The implementation work is continuously targeting complying with most internationally recognized principles and geospatial standards. The implementation of the designed Integrated Geospatial Data Framework (IGDF) in Dubai Municipality covers many domains such as: Data Management Policy and Standards; Implementing UN GGIM standards themes; Acquisition and Data Capture Specifications; Quality Standard and policy; Meta Data standard, management & policy; Data architecture and Data Modeling; Data Catalogue & Data Dictionary; and Data integration management and Data Dissemination which Provides the ability to consistently share high-quality data both within GISCD and with other external stakeholders. This paper describes the designed Geospatial Data Framework (IGDF) and gives the status of implementing it in Dubai Municipality to date and highlights challenges and success as well as future plans .

1. Introduction

The Enterprise Geospatial Data Architecture of the GISCD, which provides the framework for realising strategic progress from the data perspective, has been designed by applying industry standard approaches in customised ways to the environment we have and with the help of the British Ordnance Survey's expert knowledge in national mapping and geospatial data services. The architecture is based on the United Nations Integrated Geospatial Information Framework (Figure 1.), which provides a guide as to the strategy, implementation, and actions required at a very high level, to strengthen arrangements for National and Sub-National geospatial infrastructures. This was done on the believe that implementing the UN framework will provide unique opportunities where GISCD can advance to utilise; new survey techniques, more types of spatial data, and with the most appropriate foundations to manage and release the value in the data.

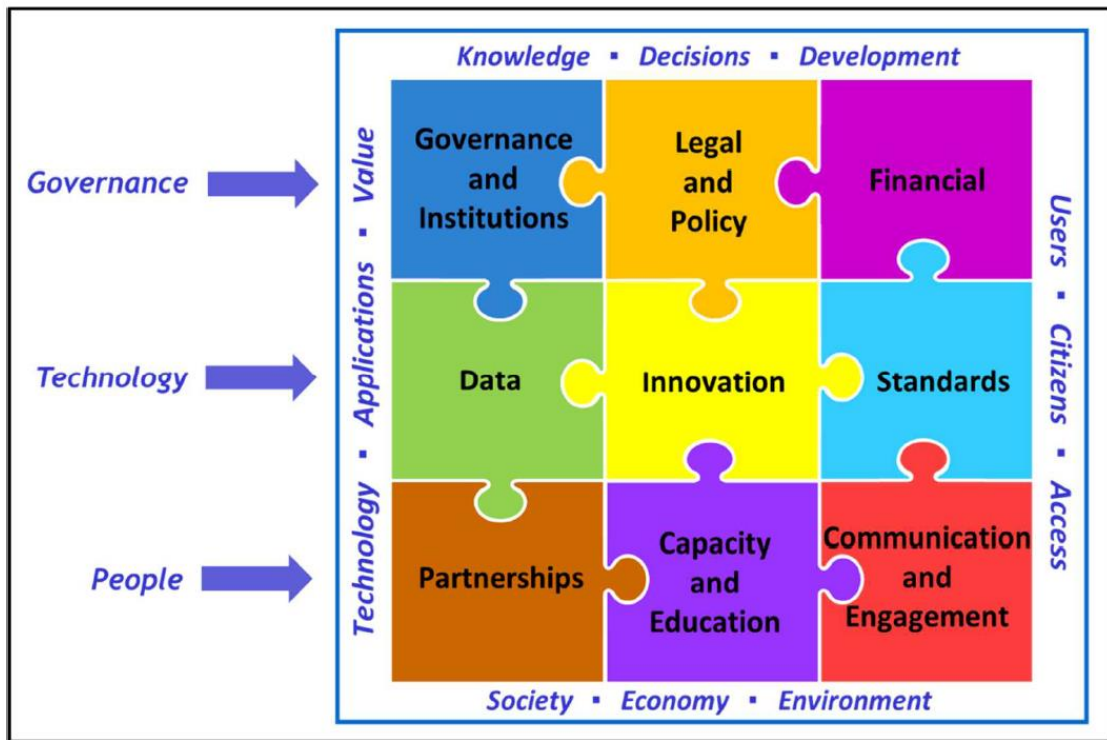


Figure 1. The UN Integrated Geospatial Information Framework with nine strategic pathways.

2. GISCD EDITED AND MAINTAINED GEOSPATIAL DATA

The geospatial data stored and maintained by the GISCD and shared with stakeholders and customers comprises data received from Dubai Municipality Departments created and edited by internal users, data received from external government and semi-government entities

whereas created and edited by editors of these external entities; and data created and edited by the GISCD own editors. The set of these data is shown in figure 2.

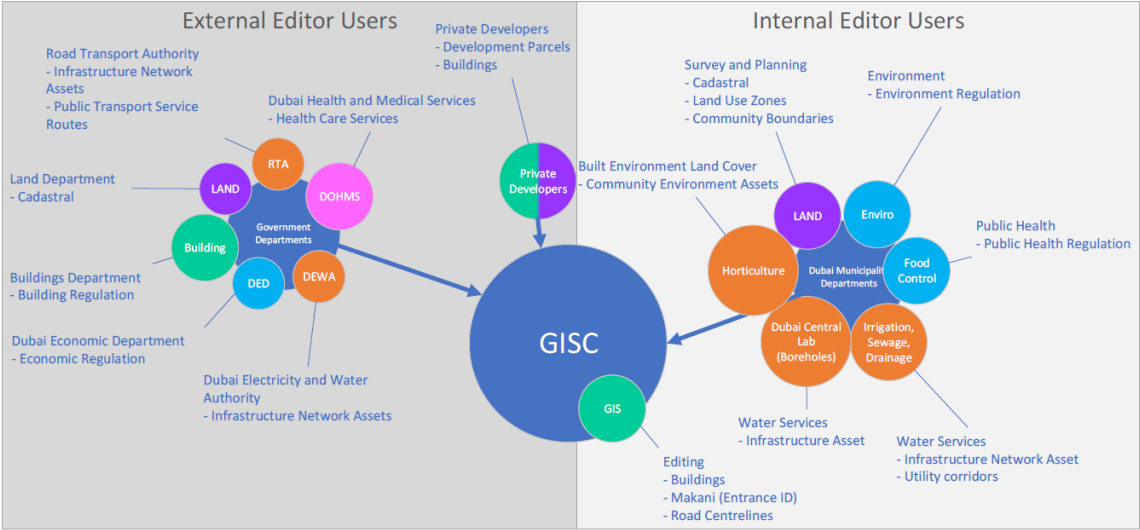


Figure 2. GISCD edited and maintained Geospatial data

3. GISCD OPERATING MODEL

To visualise the sequence of steps which GISCD business takes to create and deliver value to the final consumer and everything that supports it, an operating model, which a conceptual structure that supports the viability of the business and explains how it operates, has been designed. This sequence of steps, shown in the model, is the value delivery process. The operational model was designed with the following proposition:

- **Lead supplier of data:** Being the single-source provider of official, authoritative geospatial services to and on behalf of the Government of Dubai.
- **Responsible for the complete supply chain:** From the collection of data through to delivering the data to the customer.
- **World class data collection operation:** Maintaining a world class data capture and maintenance operation that supports and underpins the provision of Fundamental Geospatial Data Sets (FGDS).

To be able to deliver this value proposition, GISCD adopted a proactive, predictable and reliable, continuous revision production philosophy. This revised approach involves consistently engaging with stakeholders to determine their current and future needs; looking ahead to determine the services and solutions that may be required in the future, and planning and scheduling operations to deliver data that meets known demand on time and in full (OTIF).

Figure 3 shows the Operating Model which describes how GISCD will deliver value to the customers and stakeholders.

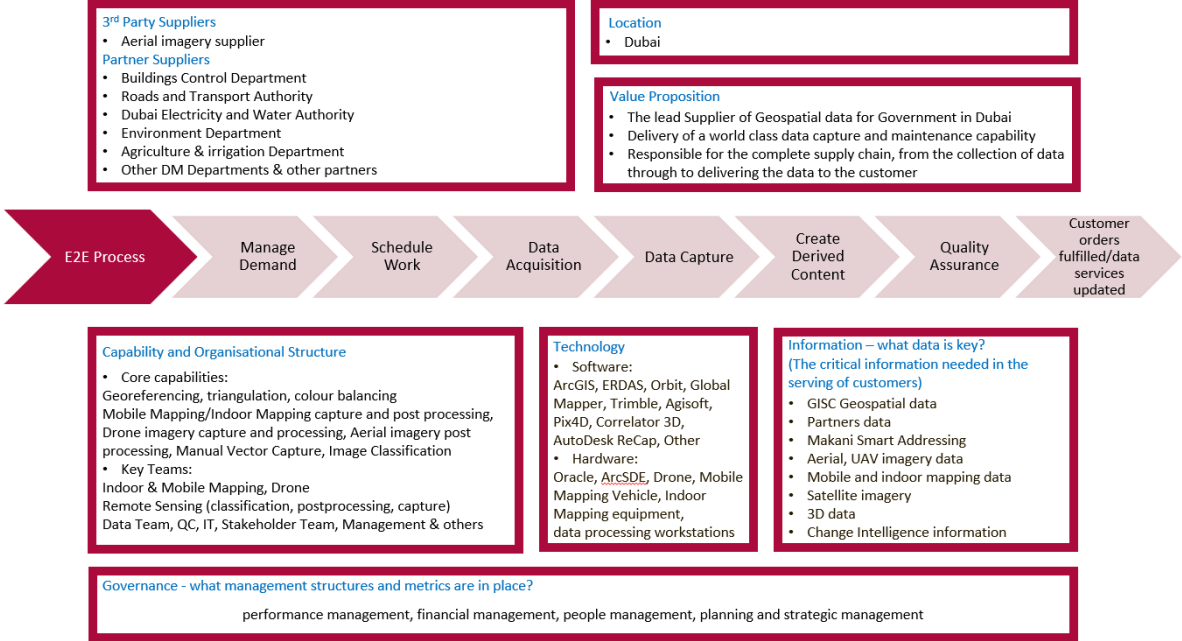


Figure 3. GISCD Operating Model

4. GISCD GEOSPATIAL DATA ARCHITECTURE

Information architecture is the basis for good data management, data acquisition, processing and publishing geospatial data. The architecture also helps in associated change and evolution of business process, business culture, and systems design. Conceptually, the data architecture was seen to be consisting of: **System of Record; System of Insight; System of Reference; and System of Engagement.** With this conceptual data architecture in mind and aligning its approach to data with the latest business goals, as part of the enterprise continuum, GISCD has come with the Geospatial Data Architecture depicted in high level terms in Figure 4. The GISCD Enterprise Data Architecture sits alongside application and platform, security, and business enterprise architectures which should also exist and be maintained.

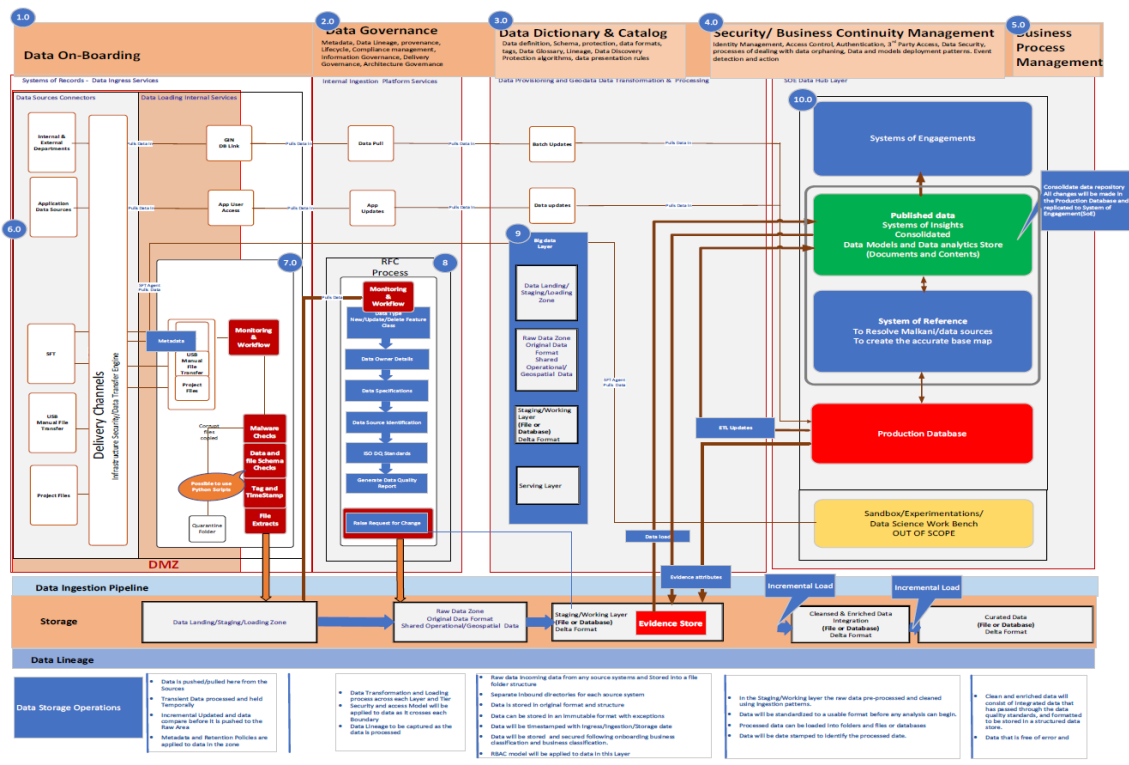


Figure 4. GISCD Geospatial Data Architecture

The data flow in this architecture is streamlined to automate as much data ingestion and dissemination processes. Figure 5 below depicts the data flow in high level terms. As can be seen in figure 5, the metadata is automatically updated and maintained. Likewise data catalog and data dictionary are also become part of the system of engagement and automatically generated and maintained.

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Halima Alnaqbi (United Arab Emirates)

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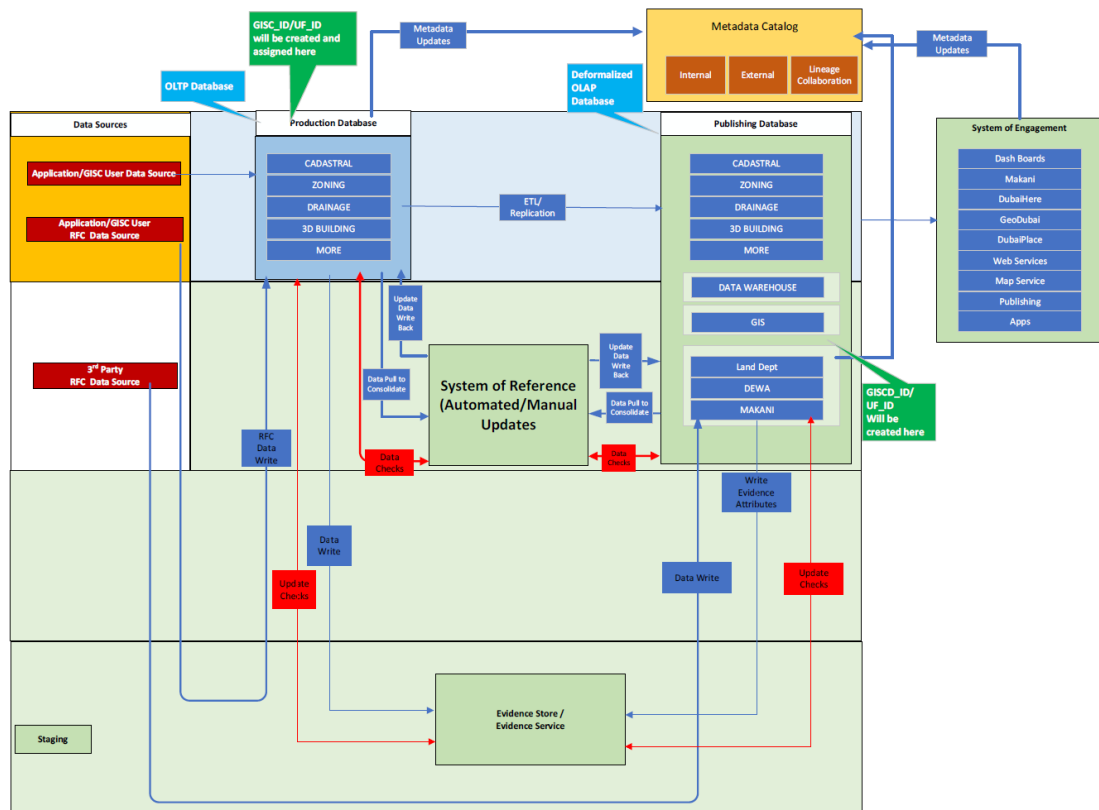


Figure 5. Data Flow

5. GISCD INTEGRATED GEOSPATIAL DATA FRAMEWORK ACHIEVEMENTS

As mentioned above, the UN integrated geospatial data framework (Figure 1) has been used by the GISCD to establish its data management framework. This GISCD framework is based on the adopted geospatial data architecture explained above. The GISCD Integrated Geospatial Data Framework covers all building blocks of the UN recommended framework. In addition to this, a structure of governance consisting of three committees has been established: Standard committee, Policy committee and Technology committee reporting to a governance committee that receive, review and approve proposals from the three governance committee reports to Governance Board formed from the Section Managers, Figure 6 shows the structure of the governance committees. The implementation of such framework is seen to take few years to be fully realized. However, a considerable progress has been achieved during the first implementation year. The main achievements are given in the following sections:

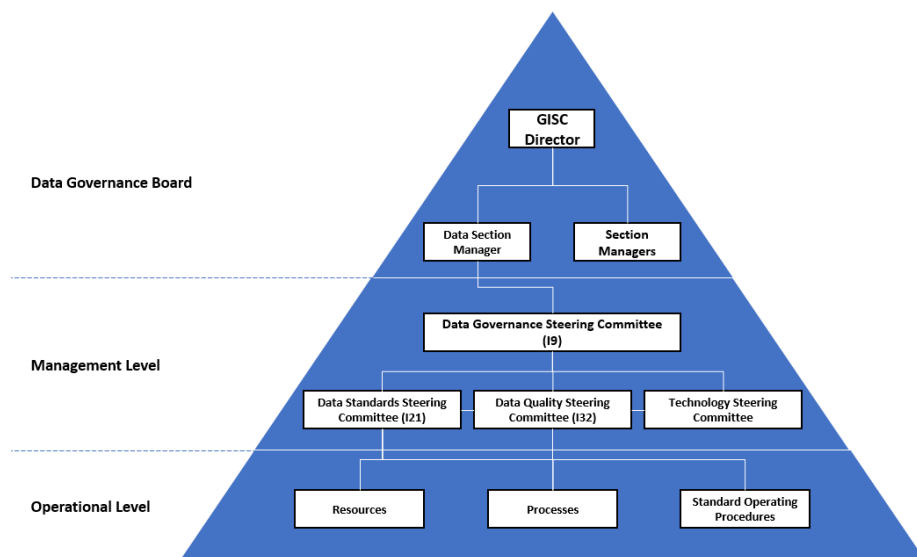


Figure 6. Data Governance Organisational Structure

5.1 Data Management Policy and Standards

Workshops and discussion of data management and data quality policies has been held and finalized by producing and approving GISCD data management and data quality documents. Following these workshops several data acquisition standards have been produced to cover all available technologies such as aerial photography, drone photography, street mapping, satellite imagery, indoor mapping.

5.2 Implementing UN GGIM standards themes

With data sharing in all levels spanning from national to global level in mind, the GISCD geospatial data has been classified and organized based on the UNGGIM themes. All the Fundamental Geospatial Data Sets are now served to the customers under these standard themes.

5.3 Data Capture Specifications

A standard data capture specification template has been produced and implemented internally for buildings, roads, water bodies, greeneries and landscape.

5.4 Quality Standard and policy

Data quality checking and maintenance process based on ISO19157 standard have been designed and implemented to comply with the data quality policy mentioned above. In this 14 data quality elements as described in ISO19157 have been addressed in the data quality checking processes.

5.5 Meta Data standard, management & policy

ISO19115-1:2014 has been implemented in creating metadata for all FGDS datasets. First a standard template was designed on which metadata of all datasets have been compiled before being implemented in ESRI stylesheets and XML documents.

5.6 Data architecture and Data Modeling

Based on the adopted geospatial data architecture, data models have been revisited and improved to comply with the architecture and data ingestion and maintenance requirements.

5.7 Data Catalogue & Data Dictionary

Previously these two had been manually generated and maintained. This had been a challenge in the environment of rapid change and additions. With the implementation of the adopted geospatial data architecture, extraction of data catalogue and data dictionary has been automated as part of the system of data engagement. Data integration management and Data Dissemination which Provides the ability to consistently share high-quality data both within GISCD and with other external stakeholders.

5.8 Data integration management and Data Dissemination

GISCD geospatial data architecture has adopted the feature unique ID as a combination of the owner feature ID and Dubai Municipality unified code (DMU code). This is in addition to the GUID. These codes will be continuously maintained and used for identifying change and edits of the data received against the reference data. This makes it possible to consistently share high-quality data both within GISCD and with other external stakeholders as map and feature services provided by the system of engagement. Adopting these ID codes throughout the life cycle and supply chain is seen to improve the level of data integration.

6. CONCLUSION

The Geographic Information Center Department (GISCD) has a clear road map towards establishing the Integrated Geospatial Data Framework. The Department has started implementing this roadmap and with the first year of implementation a very good progress has been achieved laying the essential governance and data management structure in terms of committees, data policies, specifications, standards, data architecture and re-engineering of processes to automate as much as possible data quality checking, ingestion, change and edit identification, and updating.

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Address:

1. GIS Data Expert, GIS Center Department, Dubai Municipality, P.O. Box 67, Dubai, UAE;
email: isyx_anniweir@dm.gov.ae
2. Principal GIS Design and Audit – GIS Center Department, Dubai Municipality Dubai Municipality, P.O. Box 67,
Dubai, UAE. Email: Haalnaqbi@dm.gov.ae