

Building the case for a bottom-up approach to SDI stakeholder collaboration – experiences from South Africa

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Abstract: Inclusive governance remains a challenge for the South African Spatial Data Infrastructure (SASDI). This is evidenced through the limited participation of sub-national government in SASDI and the challenges they experience with access to fundamental geospatial data. The purpose of this paper is to make recommendations for enhancing the role of sub-national government and other users in SASDI. Semi-structured interviews were conducted with representatives from municipalities and the municipal land use application process was used as a case study. The interviews confirmed that municipalities are striving to operate efficiently, but that limited access to fundamental geospatial data constrains them. Based on the results, it is recommended that access to geospatial data be improved through an integrated approach to stakeholder collaboration, coordinated by the SASDI. Such collaboration would proactively pursue inclusive governance and could significantly improve access to fundamental geospatial datasets.

Keywords: SDI, stakeholder collaboration, bottom-up, municipalities, interorganisational, geospatial information

1. Introduction

The concept of a spatial data infrastructures (SDI) has gained much attention and investment over the last few decades. Ultimately, the purpose of the SDI is to maximise and optimise the use of geospatial resources to serve national and international objectives for sustainable development and living. The SDI concept has evolved over the years; it has become more about reconciling the needs of the collective and the individual (Box, 2013). In recent years however, the question has been raised whether SDIs have to move on to something more organic and self-regulating like the geospatial ecosystem? In developing countries like South Africa, it is harder to justify such a departure, considering the resources already invested, the state of technology and the limited integration of geospatial data with other disciplines. The United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM) has developed a formal approach to geospatial information management, the Integrated Geospatial Information Framework (IGIF). The IGIF is underpinned by the 2030 Agenda for sustainable development and aims to provide developing nations with an integrated approach to manage their geospatial resources. The IGIF supports existing infrastructures, like SDIs, but challenges those platforms to operate beyond their traditional boundaries, so that diverse data from various sources can be integrated to serve a larger pool of users.

South Africa, through its membership on the regional committee for Africa, actively participates in the work of the UN-GGIM. As such, the coordinating body of the South African SDI (SASDI) envisages the implementation

of the IGIF at the national level. To support this vision, this research proposes an adaptation of the existing SDI implementation to strengthen its governance. For the SASDI, that means enhancing the role of sub-national government and other users and promoting and enabling collaboration amongst stakeholders to improve access to geospatial data.

In 2013, the new system of spatial planning and land use management was introduced in South Africa. Of interest to this research is the municipal land use application process, which was selected as the case study because the process includes the inputs of several stakeholders, requires various fundamental geospatial data to make a final decision on the application, and fundamental data is derived from this process, i.e. the land use rights and zoning data.

This paper is structured as follows, section 2 provides the background and context, which includes a brief description of the SASDI, the public administrative system and spatial planning and land use management in South Africa. A description of the method is given in section 3 and the results of the investigation are in section 4. Section 5 has the conclusions and thereafter recommendations for enhancing the role of sub-national government and other users in SASDI through stakeholder collaboration are provided in section 6.

2. Background and context

2.1 South African Spatial Data Infrastructure (SASDI)

The SASDI has a long history, dating back to the early 1990s, initially it was a voluntary initiative by national

departments and later it was established by the Spatial Data Infrastructure Act No. 54 of 2003 (hereafter referred to as the SDI Act) (South Africa, 2003) (Siebritz *et al.*, 2022). Throughout the years, national government has maintained control over the implementation of the SASDI, particularly the Department of Agriculture Rural Development and Land Reform (DARD & LR) who is the custodian of the SDI Act. Considering this, the implementation of the SASDI has followed a hierarchical, top-down approach where the instructions and rules are relayed from the national department to sub-national government. As critiqued by Siebritz *et al.* (2021), the involvement, especially from municipalities in the SASDI, has remained low because no bottom-up mechanisms have been developed to encourage and enable such participation. The authors also state that the SDI Act is "...vague in many regards" and that it lacks integration with other pertinent legislation, such as the Spatial Planning and Land Use Management Act No. 16 of 2013 (hereafter referred to as SPLUMA). In fact, Siebritz and Coetzee (2022), demonstrated this inadequacy in their statutory investigation of the influences that the various stakeholders have on the land use application process in municipalities and the geospatial data derived from that process. According to their findings, there is no support from the SASDI to municipalities in the capturing of geospatial land use data, despite it being a fundamental geospatial dataset.

2.2 South African public administration

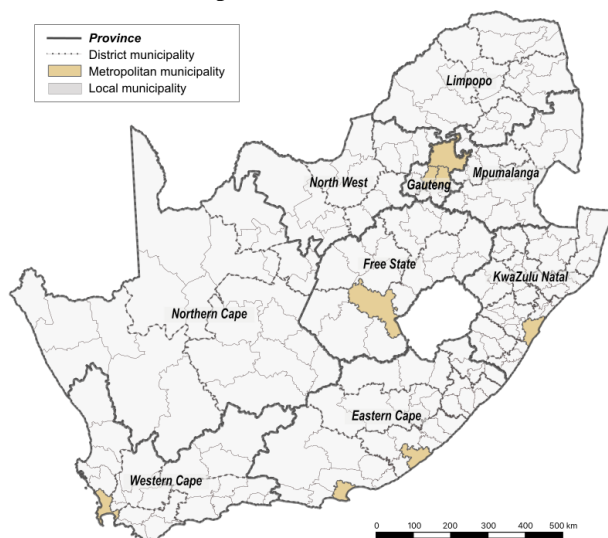


Figure 1: Demarcation of district, metropolitan and local municipalities and provinces in South Africa (Siebritz *et al.* 2021)

South Africa gained democracy in 1990, with its first democratic constitution promulgated in 1994. In the Constitution of the Republic of South Africa, 1996, the political system and administration were redefined as three distinct, interrelated, interdependent spheres, i.e. national, provincial and local (South African Government, 1996). The powers and functions for each sphere are outlined in the Constitution and further detailed in other pieces of legislation. In terms of the geographic demarcations, the country is divided into nine provinces, which are further

divided into municipalities. Municipalities are demarcated as 'wall-to-wall', covering the entire territory of South Africa. Of the three categories of municipalities (district, metropolitan and local), local municipalities are located within the bounds of district municipalities and therefore share executive and legislative authority, whereas metropolitan municipalities have exclusive authority for their jurisdiction. Figure 1 depicts the geographic demarcations of municipalities and provinces in South Africa.

A municipality is represented politically by the Municipal Council with the Mayor as the Head. The administration is headed by the Municipal Manager (South African Government, 1998) [section 82]; the administration implements political decisions through its various departments, which translates to the provision of public services (South Africa, 2000) [section 76]. The allocation of land use rights and the regulation thereof is one such service provided by local and metropolitan municipalities.

2.3 Spatial Planning and Land Use Management Act (SPLUMA)

SPLUMA is an important post-Apartheid legislation, which aims to address the spatial and regulatory injustices of the past through equitable and efficient spatial planning and land use management in all spheres of government (South African Government, 2013). SPLUMA is considered a national framework legislation, thus allowing provincial governments to develop provincial legislation that is more detailed and specific to their contexts (Laubscher *et al.*, 2016). However, the decision to develop such legislation lies with the province and thus far, only the Western Cape Province has enacted provincial legislation, the Western Cape Land Use Planning Act No. 3 of 2014 (LUPA) (Provincial Parliament of the Western Cape, 2014). The role of provincial government is provided for in section 10 of SPLUMA. To summarise, provincial government must provide support (e.g. assist with municipal land use schemes) and monitoring (e.g. coordinate land use management systems of different municipalities) functions to municipalities. Similarly, national government must provide support and monitoring, but at a higher, more strategic level, for example, national government must "...develop mechanisms to support and strengthen the capacity of provinces and municipalities to adopt and implement an effective spatial planning and land use management system" (South African Government, 2013) [section 9(2)].

The legislation is underpinned by five development principles, which includes the principle of 'good administration' (South African Government, 2013) [section 7(e)]. This principle specifically relates to an integrated, intergovernmental approach to spatial planning and land use management, i.e. all related legislation must be adhered to and all affected stakeholders must have an opportunity to provide their inputs. With respect to land use allocation and regulation, municipalities have the decision-making power, unlike the previous legislation which granted this power to provincial and national

government. Although, all land use decisions must conform to a Municipal Spatial Development Framework (MSDF), which in turn complies with the regional, provincial and national SDFs, respectively (Department of Rural Development and Land Reform, 2015) [section 15(2)(e)]. Further to this, SPLUMA calls for the establishment of a Municipal Planning Tribunal (MPT) (South African Government, 2013) [section 35(1)] in each municipality to promote fairness and remove the influence of political agendas (Siebritz and Coetzee, 2022).

Municipalities may pass spatial planning and land use management by-laws, especially for the implementation of a land scheme (South African Government, 2013) [section 32(1)]. A land use scheme includes all the categories of land use zoning for its jurisdiction, which complies with the MSDF. The Regulations made in terms of SPLUMA provide basic guidelines for the standard land use categories, but essentially municipalities must develop their own land use schemes. This means that every land use scheme is different and the geospatial land use data is captured differently for every municipality.

3. Method

Following the case study method, the municipal land use application process was used to understand how different municipalities have implemented this process, what the factors are that influence it, how geospatial information is managed to support the municipality and how the SASDI influences municipal geospatial data management.

3.1 Sampling the Semi-structured Interviews

Using a semi-structured interview approach, representatives from six municipalities were interviewed in the Western Cape and three in the Gauteng provinces between February 2021 and June 2022. The Western Cape is a coastal province, situated in the most southwestern region of South Africa with the Atlantic Ocean on the western boundary and the Indian Ocean on the southern boundary. It covers an area of roughly 129 400 km², which is divided into one metropolitan municipality and five district municipalities that are further divided into 24 local municipalities (Britannica, 2019). The population estimate in 2022 was around 7,2 million people for the Western Cape (Department: Statistics South Africa, 2022). Gauteng, on the other hand, is a landlocked country situated in north-east of the country. Although Gauteng is the smallest province, it is the most populated, accounting for approximately 26,6% of South Africa's population (i.e. 16,10 million people) (Department: Statistics South Africa, 2022). Gauteng has three metropolitan municipalities and two district municipalities that are divided into six local municipalities (also refer to Figure 1).

Where possible, two interviews were conducted per municipality, one with a land use expert and a follow-up interview with a geospatial expert. In total 16 interviews were conducted. The Western Cape municipalities were advised by the provincial Department of Environmental Affairs and Development Planning (DEAD & DP), who

monitors land use management in municipalities. Their list comprised a few municipalities that scored either 'high', 'medium', or 'low' in terms of their ability to successfully implement land use management systems. Interviews for the Gauteng municipalities were secured through mutual contacts. Table 1 lists the interviews for the two provinces, their municipal category and the date of the interview. To protect the identity of the interview participants and the municipality, aliases were used (e.g. Municipality 1).

Alias	Category	Date of Interview
Municipality 1	Metropolitan	(1) 16 March 2021 (2) 30 May 2022
Municipality 2	Local	(1) 5 March 2021 (2) 22 Nov 2021
Municipality 3	Local	(1) 22 Feb 2021 (2) 13 June 2022
Municipality 4	District	(1) 25 March 2021
Municipality 5	Local	(1) 18 March 2021
Municipality 6	Local	(2) 30 March 2021
Municipality 7	Metropolitan	(1) 23 April 2021 (2) 3 May 2021
Municipality 8	Metropolitan	(1) 13 April 2021 (2) 4 June 2021
Municipality 9	Metropolitan	(1) 3 May 2021 (2) 4 May 2022 (3) 30 May 2022

Table 1: List of municipal interviews for the Western Cape and Gauteng provinces

The interview participants provided thick descriptions in their responses. This was achieved by, i) ensuring their anonymity, ii) asking open-ended questions, iii) asking their opinion or interpretation of certain aspects, iv) allowing the interview to deviate from the pre-defined questions and v) demonstrating active listening and acknowledging their efforts within the municipality.

3.2 Qualitative Analysis of Semi-structured Interviews

The constructivist paradigm was used as the philosophical underpinning for the interviews. This means that the participants play an active role in constructing their reality, which in this case was observed through the land use application process (Guba and Lincoln, 1994)[pp. 110-111], (Flick, Ernst von Kardorff and Steinke, 2004)[p.88], (Hays, 2004)[p.133]. The paradigm allows for versions of the truth, provided from different perspectives and contexts, which was crucial for proposing a bottom-up approach to SDI stakeholder collaboration.

The analysis of the interviews employed an interpretive epistemology, i.e. the researcher interprets the interviews. This interpretation process involved reasoning, explaining or finding meaning and drawing conclusions, iteratively. It was informed by mental models (Galotti, 1989) (i.e. perception of reality), formal models (i.e. description of reality), the theoretical framework (i.e. system or supposition of ideas to explain reality (School of Social

Work, 2022)) and the legislation (i.e. rules that govern reality).

4. Results

The results are presented in five parts, firstly, the municipal land use application process; then, the role of provincial and national government in this process. The fourth part presents the internal structures of and influences on this process and the municipality, generally. Lastly, the role of the SASDI in municipal land use with reference to the geospatial data that forms part of this process is discussed.

4.1 The Municipal Land Use Application Process

The municipalities vary significantly in structure and operations, not only between provinces but also within a province. Even so, from those that were interviewed, it is possible to describe a generic land use application process. Land use applications are submitted to the municipality, either manually (in office, hardcopy submissions or via email) or automatically via an online system. The land use unit, or at the very least, a dedicated land use expert receives and processes the applications. As part of this process, the expert consults various underlying geospatial data (e.g., engineering services, biodiversity, geology etc.) to reach a decision. Then, the municipality notifies all internal and external stakeholders that may be affected by the application. In most cases, notification to internal stakeholders is automated using a land use application system. External stakeholders are notified via email or registered mail. The stakeholders are required to provide their recommendations within the specified period, which municipalities adhere to strictly. The consultation process also extends to the public, who are welcome to give their comments at public meetings or other digital platforms made available by the municipality. Each municipality has a delegated official and an MPT who must give the final decision on applications. Generally, the delegated official makes the decisions, but for more complicated applications, the MPT is consulted. All decisions are recorded by the municipality and must also be reflected spatially (i.e. a map). Only one of the municipalities interviewed has a system that allows them to automatically capture their decisions spatially in their GIS. All the other municipalities employ a manual process, and for many of them that happens in a different unit that is responsible for geospatial data management.

Apart from one municipality in the Gauteng that was still in the process of finalising their spatial planning and land use management by-laws, all the municipalities interviewed have a SPLUMA compliant land use application process.

4.2 Provincial Government Involvement

Provincial involvement in municipal affairs depends on several aspects, such as: the political leadership, the provincial governance structure, the number and categories of municipalities within the province, the intergovernmental relationships and the financial state of municipalities. Irrespective of this, within every province

there is an office that is responsible for monitoring and supporting municipal land use management - in the Western Cape, it is the DEAD & DP and in Gauteng, it is the Gauteng Planning Division (GPD). According to the municipal interview participants, DEAP & DP provided great assistance to municipalities with the development of their spatial planning and land use management by-laws. Participants also highlighted that the Department helped with speeding up the stakeholder consultation processes. One municipal participant also mentioned the Provincial Planning Heads Forum that allows municipalities to raise their concerns, discuss their projects and suggest changes to legislation (Municipality 1: Participant 1, 2021). In a discussion with representatives from the DEAD & DP, they stated that going forward, they plan to provide more coordinated support to municipalities (Siebritz, 2020).

GPD on the other hand, implemented a strategic, coordinated approach through the Gauteng City Region (GCR) SPLUMA Implementation Plan, for which they evaluated each municipality's spatial planning and land use management status, so as to provide targeted support and guidance (Gauteng Planning Division: Development Planning, 2016). The GPD representative stated that the metropolitan municipalities had managed to implement the SPLUMA requirements, but the local municipalities required support especially because with the previous planning system, "...the smaller and rural-based municipalities relied heavily on the capacity and support by provincial sector departments, especially the more rural municipalities and the outskirts" (Hay, 2021).

In both provinces, in terms of monitoring, the provincial reporting requirements appear to be relaxed, because municipalities only have to provide periodic/annual reports on the number of applications processed within the specified period.

4.3 National Government Involvement

Mention of the DARD & LR was minimal in the interviews; only one Western Cape municipality mentioned that one of their municipal attorneys was participating on the legal reform team, initiated by the DARD & LR. Other than that, it was evident that there was no direct engagement between the municipalities and the national department on land use matters, except if the municipality had to consult the DARD & LR on an application. Municipalities rely on the intergovernmental relationships between national and provincial government for communications between municipalities and national government. For municipalities, compliance with provincial legislation, regulations and instructions means that they are compliant with the requirements of national government.

4.4 Internal Influences

From the interviews, several influences on the municipal function were highlighted. The main influences are summarised in the sections that follow.

4.4.1 Organisational Structure

As stated earlier, municipalities vary in structure, even those that fall within the same municipal category. According to legislation, the municipal administration may provide public services through its internal departments or a business unit that operates under its administration, or even externally through service level agreements with other entities (South Africa, 2000) [section 76]. Gauteng is the only province where municipalities rely on specialised entities for the provision of services (Maluleke, 2022). Municipalities in other provinces operate through their internal departments, but many of them outsource of their services to the private sector (further discussed in section 4.4.4).

Part of this investigation was to determine whether the organisation is functional, or process focused and how that influences the efficiency of the municipal business processes. In a functional setup, similar or related activities are brought together in separate organisational units versus a process-focused setup where all the activities that relate to a specific process are kept together in one organisational unit (Dessers *et al.*, 2010). The results were mixed, with some municipalities, the entire land use application process is completed within a single unit, although they often have a geospatial expert to capture and manage the land use data. In other municipalities, the data capturing is seen as separate and is thus captured by the unit managing the geospatial data for the municipality. It was not possible draw conclusions about the impact on efficiency; participants rather complained that their land use and GIS systems (all except Municipality 1) were not integrated or that they did not have a dedicated resource to ensure their land use data is kept up date (Municipality 2: Participant 1, 2021), (Municipality 3: Participant 1, 2021), (Municipality 6: Participant 1, 2021).

4.4.2 Managerial support for GIS and SDI

The positive effect of managerial support for GIS and SDI was observed in a few municipalities. In Municipality 2, the geospatial unit developed a new GIS strategic plan to completely revamp the existing data governance because of the City Manager's drive for GIS implementation (Municipality 2: Participant 2, 2021). The participant from Municipality 1 described their GIS strategy, which dates back to 2008 (Municipality 1: Participant 2, 2022b), (Municipality 1: Participant 2, 2022a). The development of the strategy was motivated by the instruction from management to comply with the SDI Act. In addition, early on the municipal management had set a vision to make their data easily accessible to users. In line with this, the municipality has published an open data policy, and they have an advanced online data portal, accessible to all users. Municipality 8 also demonstrated significant progress with implementing a local SDI. Key to their progress was the legal instruction from management, an SDI champion in a senior management position to drive the implementation and an SDI team to raise awareness and provide support the various municipal units.

On the contrary, municipalities where the awareness of GIS and SDI is still lacking at the managerial level, have

suffered – many of the participants had never heard of SDI prior to the interview. The participant from Municipality 4 explained how geospatial data expertise had not been prioritised and as a result the municipality is stuck in a situation where they had spent a great deal on a GIS system that is currently unusable, and the departments are scrambling for the geospatial data they require (Municipality 4: Participant 1, 2021).

4.4.3 State of Geospatial Data Governance

The previous section already provided some perspective on the state of geospatial data governance in the municipalities that were interviewed. Apart from Municipalities 1 and 8, there is less evidence of data governance in municipalities; rather, the focus is on data management. To clarify, data management executes what is defined by the data governance, such as principles, policies and rules (Khatri and Brown, 2010). Many municipalities do not have the advanced geospatial expertise required to develop an organisation-wide data governance strategy. One participant described having a GIS unit as a “luxury” that “poorer” municipalities do not have (Municipality 7: Participant 1, 2021). Thus, municipalities tend to operate with what they have and with what they require. Three examples are mentioned here to demonstrate this, firstly, many of the participants mentioned that they continuously access geospatial data from other, free data platforms (e.g. The Cape Farm Mapper from the Western Cape Department of Agriculture – Elsenburg, url: <https://gis.elsenburg.com/apps/cfm/>) to be able to process their land use applications properly, i.e. with all the information they require (Municipality 4: Participant 1, 2021), (Municipality 6: Participant 1, 2021), (Siebritz, 2020). Secondly, there is duplicate, non-uniform data capture amongst municipal departments. One participant said that they had asked their current service provider to implement a “standard protocol” to at least avoid the internal duplication (Municipality 6: Participant 1, 2021). On the same topic, the participant stated they (the municipality) “don’t develop standards” and that there “... needs to be coordination in the geospatial industry”. Thirdly, the cadastral data which every municipality relies on heavily is obtained from the respective provincial Office of the Surveyor General (SGO). But, because this data does not meet the municipalities’ required accuracy, they spend their resources recapturing this data as the need arises (Municipality 5: Participant 1, 2021), (Municipality 6: Participant 1, 2021), (Municipality 7: Participant 2, 2021), (Municipality 9: Participant 3, 2022). In an attempt to address this, Municipality 1 has set up an agreement with the SGO, for the municipality to provide them with ‘clean’ cadastral data periodically (Municipality 1: Participant 2, 2022a), (Municipality 1: Participant 2, 2022b). Municipality 8 has gone as far as to develop a Property Value Chain Data Governance Policy that has across organisational workflows to resolve the challenges they experience with the SGO and Deeds Office data (Hattingh, 2021).

The topic of coordination for geospatial data was mentioned earlier. A few participants expressed that

coordinated geospatial activities would greatly improve the existing practices. One participant understood this to be the responsibility of the National Mapping Agency (Municipality 7: Participant 2, 2021), another mentioned provincial intervention (Municipality 3: Participant 1, 2021) and others, the SASDI (Municipality 2: Participant 1, 2021), (Municipality 2: Participant 2, 2021), (Municipality 8: Participant 2, 2021).

4.4.4 Geospatial Data Management

Because there were not follow-up interviews with all municipalities (no response to invite), some facts on the geospatial management could not be confirmed. Other than those, two municipalities had centralised GIS systems whereby all geospatial data from the departments are captured and stored. Four municipalities employed a hybrid system, meaning that data is captured within the departments and then submitted to a centralised database periodically, where all internal users may access the data. The remaining municipalities had decentralised GIS systems – the data is stored and accessed locally.

An important aspect to mention, is that every one of the municipalities procure the services of the private sector for various activities related to their data management, for example, of the Municipality 6 data is captured by a consultant who maintains the read-and-write rules for the data. The same participant stated that they do things identically with the neighbouring municipality “...based on what [service provider name] has advised” (Municipality 6: Participant 1, 2021). Municipality 3 does not have a GIS unit and thus depends on a service provider for the data management (Municipality 3: Participant 2, 2022). Both Municipalities 2 and 4 mentioned failures in their GIS because the service providers were dishonest in their services (Municipality 2: Participant 1, 2021), (Municipality 4: Participant 1, 2021). To summarise, municipalities need assistance to balance the power that service providers hold over their data and processes.

Implementation of national or international geospatial data standards is still scarce in municipalities, although Municipalities 1 and 3 have implemented a local metadata standard, Municipality 8 has implemented the national metadata standard and Municipality 9 has implemented the international metadata standard.

4.4.5 Organisational Culture

The influence of organisational culture was observed through the land use application process on two fronts, the urgency of the municipality and their collaborative efforts. Urgency is one of the attributes used to determine the influence of a stakeholder and is defined as, “the degree to which a stakeholder is prepared to go to any length to achieve the desired outcomes” (Mitchell, Agle and Wood, 1997). The urgency was deduced by observing time-sensitivity and criticality (Mitchell, Agle and Wood, 1997). All the participants indicated the time-sensitivity of processing a land use application and expressed their commitment to comply with those time-frames as set out in the legislation. Three participants from Municipalities 1, 5 and 8 respectively, explained how their compliance

with the SPLUMA time-frames are monitored through performance management systems. It should be noted that no one expressed difficulty with compliance, however at times, the feedback from external stakeholders were delayed.

Criticality is more complex to observe, because the individuals’ perception, beliefs, attitude etc. is a big influencing factor. Every participant expressed a positive attitude toward their own and their unit’s responsibilities with respect to the land use application process, as demonstrated with the following interview extract:

“...we must speed up decision making so that it can contribute to the economy on the outside. We create the environment for the economy to grow, if we delay it then everything on the outside is delayed” (Municipality 5: Participant 1, 2021)[1].

Beyond this, factors such as the political and managerial drivers and the availability of resources also determine how critical this process is. These factors, as discussed earlier vary from one municipality to the next. Overall, the municipal urgency for the land use application process was rated ‘high’ or ‘high-medium’.

Collaboration as an organisational culture was assessed in terms of formal collaborations, and whether it occurs regularly and deliberately. Behaviour that typically characterise formal collaborations is, pursuit of a common goal (Dania, Xing and Amer, 2019), trust (Box, 2013), (Sjoukema, Bregt and Crompvoets, 2020), reciprocity and a high degree of autonomy (Budhathoki and Nedovic-Budic, 2007). Municipalities generally did not have any formal collaborations with external stakeholders, even though access to external data is still a major challenge and metadata is still scarce.

Within the municipality however, the various departments do collaborate on the capturing, accessibility and maintenance of geospatial data. The corporate geoinformatics department in Municipality 8 for example, initiated a collaborative project whereby the departments and entities responsible for water property information, are working toward a standardised database (Municipality 8: Participant 2, 2021). Municipality 2 has identified similar problems regarding duplicate, disparate datasets and is therefore developing mechanisms in collaboration with the affected departments to resolve these data issues (Municipality 2: Participant 2, 2021).

4.5 State of SASDI Support to Municipalities

During the interviews, participants were asked about their awareness of the SASDI, whether they have been able to implement the requirements of the SDI Act and if the implementation has impacted the municipality positively. More often, participants had little to no awareness of the SASDI, as the data management participant from Municipality 3 said:

“I can say I heard of it. Do not engage in it. Not sure what is expected from Local Gov in this regard. I cannot speak for other Departments. Maybe they use the platform. I do not know” (Municipality 3: Participant 2, 2022)[2].

On the contrary, the participant from Municipality 9 confirmed that the corporate geo-information management unit had incorporated the SDI Act requirements into the municipality's GIS strategy and other governance documents. Furthermore, they had managed to implement international metadata standards, but "...with no national guidelines on how, what or content" (Municipality 9: Participant 3, 2022). SASDI implementation in Municipalities 1 and 8 have been discussed in earlier sections. This statement together with quote [2] summarise the state of SASDI support in municipalities – it is sorely lacking.

Despite the lack of SASDI awareness and support in the municipalities, there was evidence of SDI-like efforts being undertaken, in other words, municipalities have developed mechanisms or are working toward implementing the SDI principles of data access, data sharing and avoiding duplicate data capture. A few examples are mentioned here: 1) Municipality 2 has established a GIS steering committee that amongst other things, monitors the sharing of data (Municipality 2: Participant 2, 2021), 2) Municipality 6 is consciously sharing their data outwardly and they are creating access to external data for their users (Municipality 6: Participant 1, 2021) and 3) Municipality 7 has a centralised database for all departmental data, which has standard protocols to prevent duplicate data capture (Municipality 7: Participant 2, 2021). Other participants expressed their desire for cross-discipline data integration and the need for data standards (Municipality 2: Participant 1, 2021), (Municipality 2: Participant 2, 2021), (Municipality 6: Participant 1, 2021).

5. Conclusion

The purpose of this study was to make recommendations for a SASDI stakeholder collaboration framework based on the lessons learned from the municipal land use application process and interviews with representatives from municipalities. The information provided by the interview participants was invaluable for informing such recommendations. Unlike previous SASDI engagements with the local sphere, this study was able to uncover details about the inner workings of municipalities, the organisational culture and the challenges related to geospatial information. This paper highlighted the most salient themes drawn from the interviews, with examples from the various municipalities.

Although some municipalities appeared to be more efficient than others, all of them have been able to implement their land use systems. Metropolitan municipalities are seemingly better resourced, as evidenced by their ability to implement SPLUMA without much support from provincial government, their sophisticated technical platforms and their pro-active approach to SDI implementation. Though less so in the metropolitan municipalities, provincial government has and continues to be actively involved in supporting municipal land use management as may be required. For the smaller and rural municipalities this support has been

crucial. Provincial government may also be seen as the mediator between the national and local spheres – generally, there is no direct communication between these two spheres. Thus, successful implementation of land use relies on those intergovernmental structures and lines of communication.

This case study has also demonstrated the power of legislation. Firstly, stakeholders gain influence through the authority allocated to them in legislation. Secondly, when the legislation is no longer vague, stakeholders are able to identify and respond to their roles and responsibilities adequately. Thirdly, with clear legislative instruction from top management, municipalities respond resolutely.

When it comes to the state of geospatial data governance in municipalities, a lot of work is still needed. With the exception of one, all the municipalities interviewed do have a dedicated GIS or geoinformatics unit to manage the municipalities' geospatial data. However, municipalities could benefit greatly from the support of the SASDI in this regard.

This study is limited by the fact that not all municipalities could be interviewed due to time constraints. Also, securing the interviews proved arduous as many representatives did not respond to the invite, although this may be attributed in part to the covid-19 pandemic, when municipalities were overcome with emergency response activities. Precaution was taken to minimise the bias by verifying the information provided (i.e. the validity) against other sources (e.g. reports, implementation plans, discussions with provincial government etc.) and ensuring that the interview process was reliable.

6. Recommendations

An integrated approach to collaboration is proposed, that is founded on the principles of the IGIF (i.e. transparent and accountable, collaboration and cooperation, integrative solution etc.). The approach will enhance the role of sub-national government and other users in SASDI. The SASDI coordinating body is proposed as the implementor of such a collaboration framework, because they carry the legislative mandate. The framework should include (Peterson, 2004):

- Structural mechanisms - the formal groupings of stakeholders, their roles, responsibilities and the level of decision-making power they possess., e.g. SDI structures, intergovernmental structures, multi-stakeholder custodianship, National Mapping Agency as a coordinator of datasets
- Procedural mechanisms - encompasses all the interrelated business processes within an organisation and the rules and standards that are embedded within those processes, e.g. data coordination committee, data quality person/unit
- Relational mechanisms - facilitate collaboration, coordination and knowledge-sharing amongst stakeholders, e.g. Academia, parastatals, users, broker

- Evaluative mechanism - track and monitor the progress of stakeholder collaborations, and to determine the impact of such collaborations on the strategic objectives of the SASDI, e.g. monitoring sub-committee

7. References

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