GIS WATER USER GROUP

National GIS Capability Survey

2024

Spatial Vision

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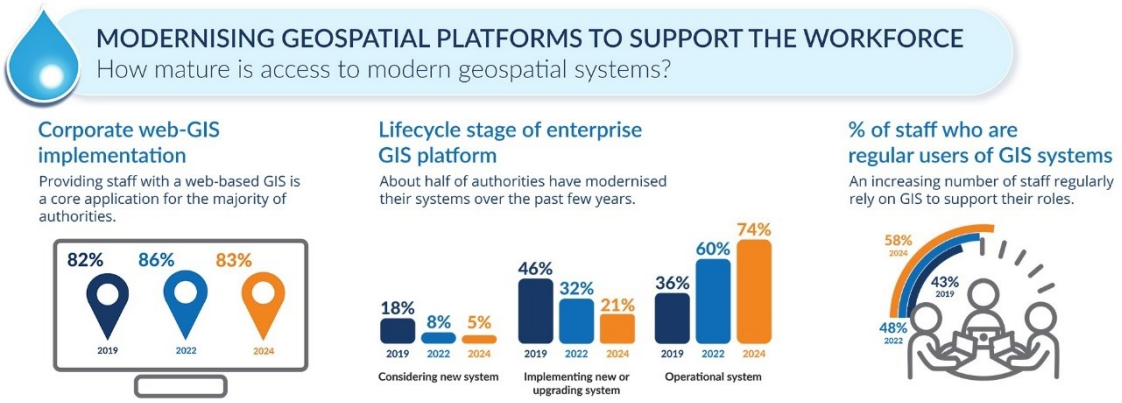
Executive Summary

The location of assets, customers and water resources are crucial to effective operations of water utilities. Geospatial information and technologies bring together the digital locations of these features to inform decisions, operations and plans.

A mature geospatial environment and supporting capabilities can open organisations up to exploring innovations to generate further business value from existing and new emerging technologies.

It is the combination of data, technology, business practices and human skills that make up each organisations Geospatial Capabilities. Spatial Vision has been conducting national surveys of the geospatial capabilities of water utilities since 2009. The purpose of the reports is to enable water authorities to benchmark their capabilities against their peers in similar authorities to help guide their future development. A **total of 22 water authorities** responded to the 2024 survey, each one is classified into one of five Authority Types.

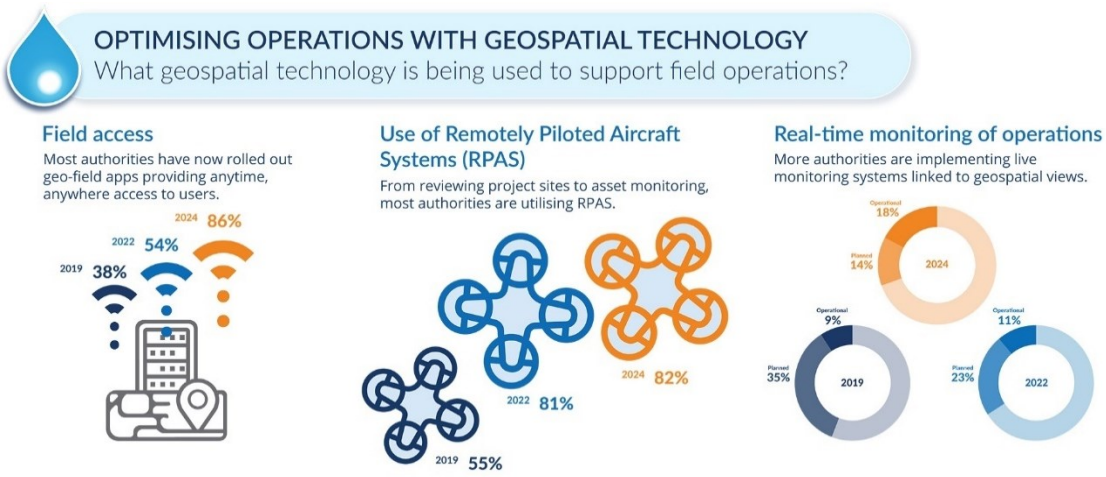
With mature Geospatial systems comes the ability to provide internal and external users with more geospatial services. Internal **corporate web-GIS portals** are now well embedded in organisations and regularly used by more than half of all staff. Typically, these GIS-portals are the one place that staff can access organisation wide information from multiple business systems hence deliver a major productivity benefit.



A related statistic is that **nearly 70%** of surveyed water authorities use **on-premise infrastructure** to host their **corporate web-GIS**. While some authorities indicated that cloud hosting is under review, this is a low number when compared to other businesses in Australia. A 2024 survey of Australian business[1] has indicated that **over 60% of businesses** have already transitioned to the cloud. It is likely that there is some efficiencies to be had by planning for a successful transition into the cloud in the near term.

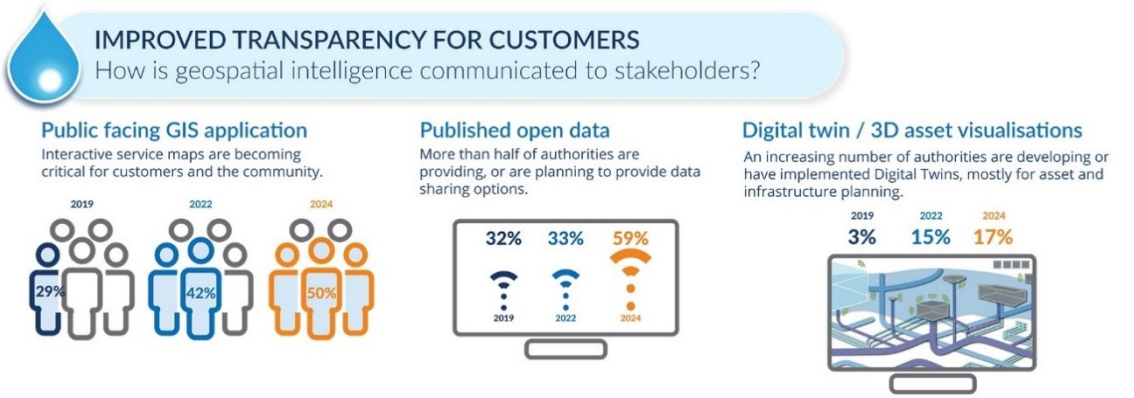
There has also been a significant increase in **field mobility services** that provide anywhere and anytime access to location-based capture workflows.

[1] Datacom's fifth annual cloud report



The use of **Remotely Piloted Aircraft Systems** (RPAS) has matured. The adoption of geospatially informed real-time monitoring of operations is the next frontier for many authorities.

There is increased number of **public-facing mapping applications** that enable the public and stakeholders to self-service information 24/7 and more open data published.



The adoption of digital twins is also steadily growing primarily for planning new assets and infrastructure.

The **digital transformation of the water industry** is vital to continue to meet the expectations of continued productivity reform, efficiency dividends and customer expectations.

The 2024 findings are evidence of a trend that GIS and geospatial information is being increasingly recognised as key to providing business intelligence and value far beyond traditional 2D static map-based views of data. These benefits include climate change planning, emergency management, network performance management, customer service, construction design and review and strategic planning.

1 Background

The water utility industry plays a vital role in ensuring that all Australian have access to clean and reliable water as well as supporting industrial and commercial sectors of the economy.

The location of assets, customers and water resources is crucial to effective operations of the utilities. Geospatial information and technologies bring together the digital locations of these features to inform decisions, operations and plans. The supporting human skills are also vital. The combination of data, technology, business practices and human skills are termed Geospatial Capabilities in this report.

Spatial Vision has worked with the water industry for almost twenty years through the provision of custom IT solutions and GIS tools, data engineering, training and strategic advice. We have also facilitated the GIS Water User Group (GWUG) primarily based in Victoria for most of this period. The User Group supports a network of water industry geospatial professional people who come together to share their challenges and successes.

Methodology

This report is based on responses by individual water authorities to a survey distributed by email from Spatial Vision. The survey was emailed to people identified as being involved or responsible for GIS in water authorities around Australia. Completion of the survey is voluntary. The specific details of each participating authority are not made available to other participants or generally.

This report is the third based on national surveys since 2018.

GIS Water User Group

Spatial Vision initiated the establishment of the GIS Water User Group, known as GWUG, almost twenty years ago. Water authorities are freely invited to participate in the User Group that meets twice per year to consider topical issues of the time facing the geospatial industry and water authorities in particular. GWUG provides the chance for water authority officers to network and collaborate. It also enables Spatial Vision to better understand the challenges faced by these authorities to improve the relevance of our services.

2 Digital Transformation

As described by *Smart Water Magazine*, the water sector is currently facing several key challenges, including aging infrastructure, climate change impacts, environmental degradation, growing water demand, and outdated management strategies. Digital technologies such as sensors, data analytics, and artificial intelligence/machine learning offer innovative solutions to these issues. By leveraging these technologies, the sector can shift from focusing solely on increasing water supply to balancing both supply and demand in resource management. Digital transformation is the integration of digital technologies into all areas of business to fundamentally change the way an organisation operates and delivers value to customers[2].

Digital transformation enables water utilities and municipalities to better understand water usage patterns, optimize efficiency, reduce water losses, and adopt circular economy and water reuse principles. Additionally, these technologies enhance real-time water quality monitoring, allowing for quick responses to issues and more precise tracking of water needs and quality.

By carefully navigating the challenges and embracing new technologies, water utilities can harness the benefits of digital transformation to improve their operations and service delivery, while building trust and transparency with stakeholders[3].

GIS and related geospatial technologies are a core component of the digital landscape. In this report, we use the term *geospatial capabilities* that covers data and technologies, also people resources, their *geo* awareness and skills. Geospatial capabilities play a significant role in enabling organisations to become digital future ready.

[2] https://smartwatermagazine.com/news/smart-water-magazine/digital-transformation-water-sector-a-game-changer
[3] ibid

3 Purpose of this Report

Spatial Vision has conducting national surveys of the geospatial capabilities of water utilities since 2009. The purpose of the surveys and reports is to enable water authorities to benchmark their capabilities against their peers in similar authorities to help guide their future development. This report includes references to the previous two reports in 2022 and 2019, that was based on the 2018 survey.

Types of Authorities

The overall management of water resources and delivery of services is the responsibility of each jurisdiction and consequently is achieved differently by each jurisdiction. Water authority types range from single statewide authorities that take responsibility for water resource management and delivery; to regional and urban authorities through to individual Councils providing services.

The scale and focus of the different types of organisations makes a significant difference to the resources and investments that can be committed to geospatial purposes. For this reason, the survey responses are aggregated by authority type to enable meaningful comparisons.

There are about 35 water utilities in Australia. The largest 22 authorities supply services to 70% of the population[4], while in some jurisdictions there are individual Councils with water supply responsibilities. Coincidently the surveys for this 2024 report were completed by 22 organisations from across Australia, however these include four Councils; not all of the largest authorities participated.

The report refers to results from previous surveys conducted in 2019 and 2022. There is a substantial overlap of authorities that have contributed to each of the 2024, 2022 and 2019 market surveys.

Key Objectives

- Support the water industry and more specific by sharing insights and learnings
- Give the reader an understanding of how their water authority's geospatial capabilities compare to that of other water authorities
- Provide commentary as to what is influencing the geospatial landscape and how this impacts water authorities
- Bring together geospatial users from water authorities from across Australia.

In previous years, we have heard from participants that these reports proved useful when speaking with senior management regarding the success of their organisations, supporting investment decisions and future directions. The data presented can provide a perspective as to whether an organisation's strategic initiatives and successes align to industry practices.

[4] https://www.trade.gov/country-commercial-guides/australia-water-and-wastewater-treatment

Audience

This report is intended to be used by Managers responsible for GIS, Geospatial Leads, IT Managers, Asset Managers and Chief Information Officers at water authorities and councils responsible for managing water assets across Australia.

Contributors

Contributors to this survey are people that manage and administer the GIS environments of their Water Authorities When this information is aggregated with other similar Authorities it provides an excellent snapshot and great insights into:

- Industry use of geospatial technology and services
- How each authority compares to other similar organisations
- Technology trends across the water industry
- Opportunities to improve maturity and support further investment

How to use this report

The report presents the overall findings for all the participating authorities.

We encourage readers to:

- Discuss results with management
- Determine what areas need attention
- Use the report as a health check
- Use this data to support business cases for investment
- Contact *Spatial Vision* if you need advice on next steps

4 Authority Profiles

Across the country, water services are managed by urban, regional, state and territory water authorities ranging widely in the services provided, number of clients, local service factors and extent of service area.

To aid the readers of these reports, the survey results for each authority are classified into five Authority Types. A total of 22 water authorities responded to the 2024 survey and the following diagram illustrates the contributing water authorities and explains how each authority has been classified using an 'example logo'.

For further context, within each surveyed authority, approximately 70% of GIS teams are located in the Assets and Operations departments, while the remaining 30% are sat within the IT Services or closely related departments.

5 Current Landscape & Key Findings

A comparison of survey results over the years has indicated that geospatial services within water authorities are maturing. The GIS team is moving from being seen as predominantly a map-making and data validation team to being a critical to overall management and dissemination of business-critical information in a location context.

Maturity of systems

Most geospatial platforms have modernised and matured in the last five years. Now more than 74% of respondents have fully operational enterprise GIS systems in place. It appears that about 50% have modernised their systems during this period.

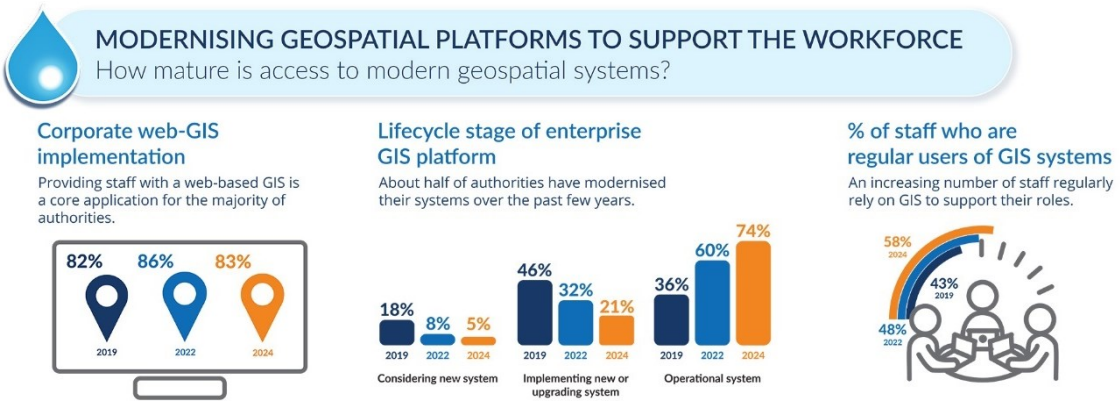


Figure 5-1: Comparison of Platforms and Use between 2019, 2022 and 2024

With mature systems comes the ability to provide internal and external users with more geospatial services. Internal corporate web-GIS portals are well embedded in (83% of) organisations and regularly used by more than half of all staff. Typically, these GIS-portals are the one place that staff can access different information from multiple business systems hence deliver a major productivity benefit.

Optimising operations

There has been a significant increase in field mobility services that provide anywhere and anytime access to location-based information and capture capabilities. This is another important productivity gain to businesses with over 85% adopting it.

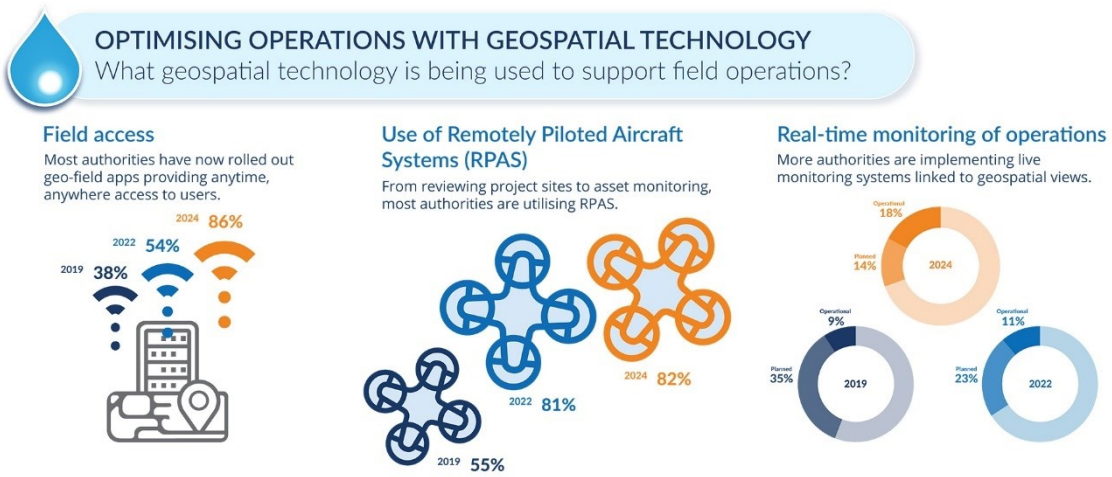


Figure 5-2: Comparison of Optimisation between 2019, 2022 and 2024

The use of Remotely Piloted Aircraft Systems (RPAS) has matured. The dominant use is for inspecting project sites and monitoring assets.

The adoption of geospatially informed real-time monitoring of operations is the next frontier for many authorities. The 2024 results indicate that more authorities are implementing these systems.

Improving transparency

There is increased number of public-facing mapping applications (50%) and more published open data (59%) that improve transparency of operations and enable more customers and stakeholders to self-respond to questions.

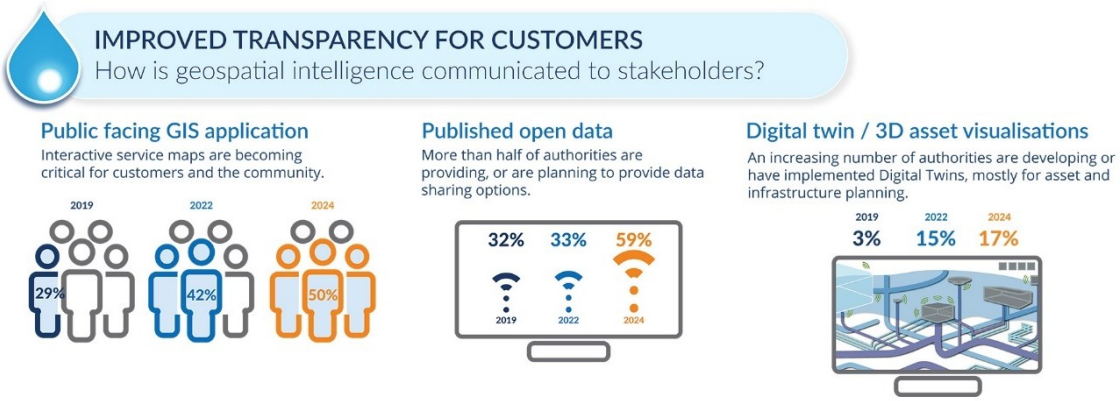


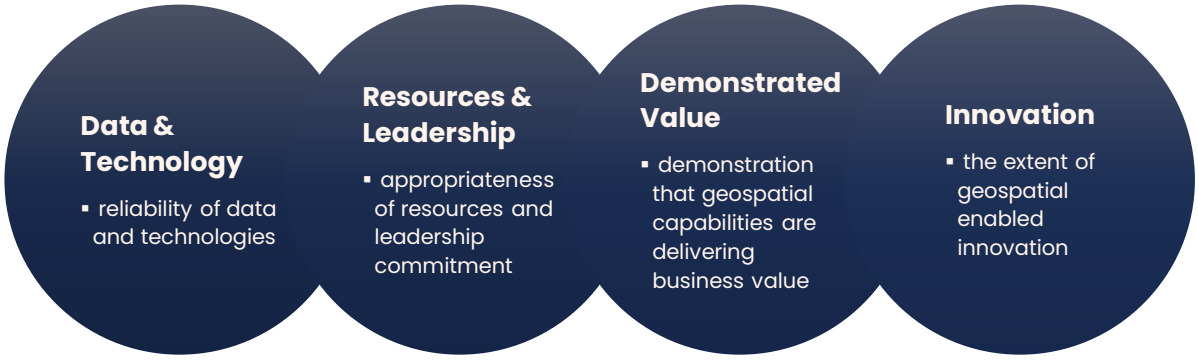
Figure 5-3: Improvements in Information Transparency between 2019, 2022 and 2024

The adoption of digital twins is also steadily growing primarily for planning new assets and infrastructure with 17% planning or implementing elements of digital twins.

6 Survey Insights

Spatial Vision developed the Geospatial Digital Transformation (GDT) measure to assist organisations to plan and measure their readiness to harness the benefits of digital transformation.

The GDT measures maturity across four key areas. The measures draw on the questions posed in the 2022 national GIS capability survey:



Details about each of these four capability areas and the responses from each type of water authority are described in Section 6.

6.1 Data & Technology

The inputs used to gauge the level of maturity of Data & Technology capabilities across Authorities includes responses to series of questions for:

- Stage in the operational life cycle for the Enterprise GIS System
- Operation of Field-based applications integrated into the GIS
- Accuracy/ quality of other available spatial data

The level of maturity is typically higher for the large metropolitan services and/or large bulk suppliers with more resources and larger budgets to enable more strategic and structure approaches to managing GIS environments and data. While the rural suppliers have indicated through their survey responses that it is tough to bring about fundamental changes to the way their organisations work as the competition for funding and fundamental limit to human and technical resourcing creates inevitable challenges. It also creates situations where innovation can also occur, often through necessity.

Figure 6-1 is designed to show a comparison of the overall response for each Authority type. With the *lines* representing the total range of responses, the *boxes* indicate the middle 50% of scores and the *point* depicts the collective mean response value.

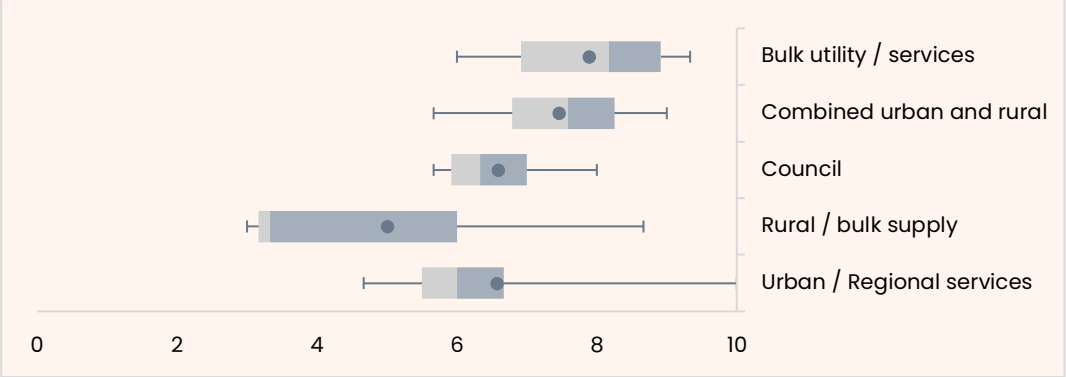


Figure 6-1: Score range across authority type for Data and Technology theme

Enterprise GIS Systems and Operational Life Cycle

The enterprise GIS systems for organisations comprise desktop or power-user GIS software, databases, publishing servers and typically a corporate web-GIS portal.

Almost three quarters of survey respondents consider their web GIS to be "fully operational". Most authorities (64%) are using systems that have been introduced in the last five years, while only one authority is maintaining a legacy system, implemented before 2009.

There are many influences on the decision to upgrade or shift from an incumbent technology to a new enterprise GIS technology. Each organisation will have some overlapping reasons, but rarely will two organisations will have the same set of priorities. This means that while we can learn from each other, the approach to each procurement decision will be arrived at using a bespoke approach that is geared to the challenges and status of each individual organisation. GIS departments should be continually adjusting to the ever-increasing changes and uplifts in technology, user and community expectations, legislative and security needs and of course demands to achieve more from the same budget allocation, or in some cases - from a shrinking budget.

Figure 6-2 indicates that a large proportion (30%) of authorities are considering upgrades or about to implement upgrades or new enterprise GIS systems. Fresh deployments of an enterprise GIS will typically take a minimum of a year, but the time taken typically depends on the complexity and importance of integrations with other business systems, the complexity of the GIS data model, which in turn affects any data migration exercises and then how many business workflows utilise GIS data, services or web apps. It is clear that more and more organisations are turning to Esri for their enterprise GIS needs, but also still maintaining strong open-source Desktop GIS deployments.

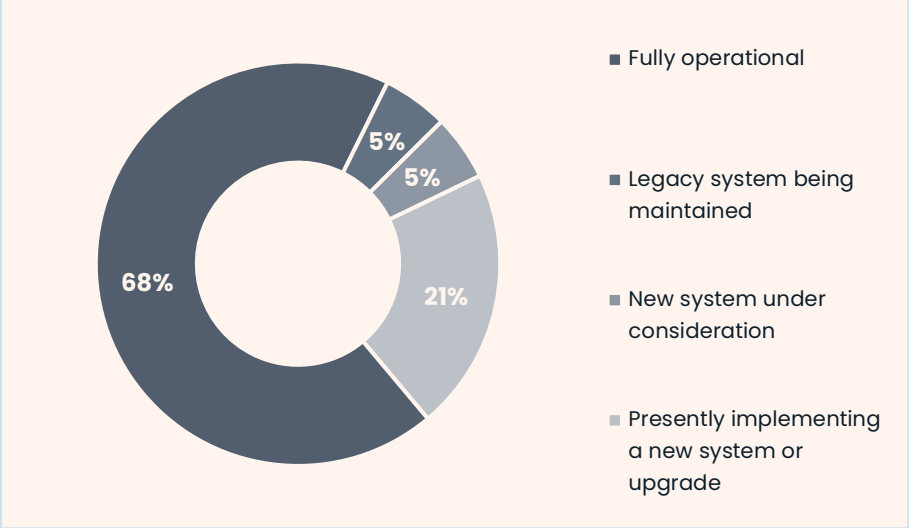


Figure 6-2: Operational life cycle stage of web GIS.

Desktop GIS Applications

Across all Authorities surveyed in 2024, although there are several spatial desktop applications in use, the use of Esri products is extremely dominant – practically every organisation has a licence to use an Esri desktop application. The chart at *Figure 6-3* illustrates a breakdown of the types of applications in use and the average number of users. It is heartening to see that there remains usage of Geomedia, MapInfo and QGIS that provide a reasonable offset to the dominance Esri sees in 2024. Organisations that use QGIS and Hexagon as their main GIS desktop applications tend to have a relatively higher numbers of desktop software users which will create additional challenges for when these organisations embark on their cloud migration journey.

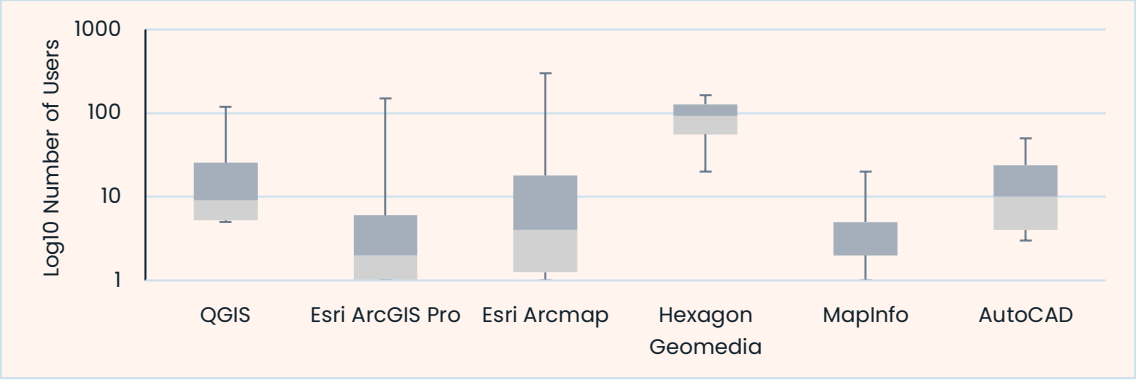


Figure 6-3: Log10 scale of desktop GIS users by desktop application name

Enterprise Hosting Infrastructure

Figure 6-4 provides a stark reminder of the investment still needed in the way water authorities host their corporate GIS and most likely many other business critical enterprise applications. Over two thirds of Water organisations host their Enterprise GIS solutions on-premises. There is only one authority strictly using a Software-as-a-Service (SaaS) solution, with five using a combination of both.

Many challenges are faced by an authority wanting to move to the cloud. If it is not forced on the organisation, there are likely to be security and data sovereignty concerns, costly redesign of business system integrations, lack of internal resource expertise - all of these concerns presently discourage organisations from moving enterprise applications to the cloud.

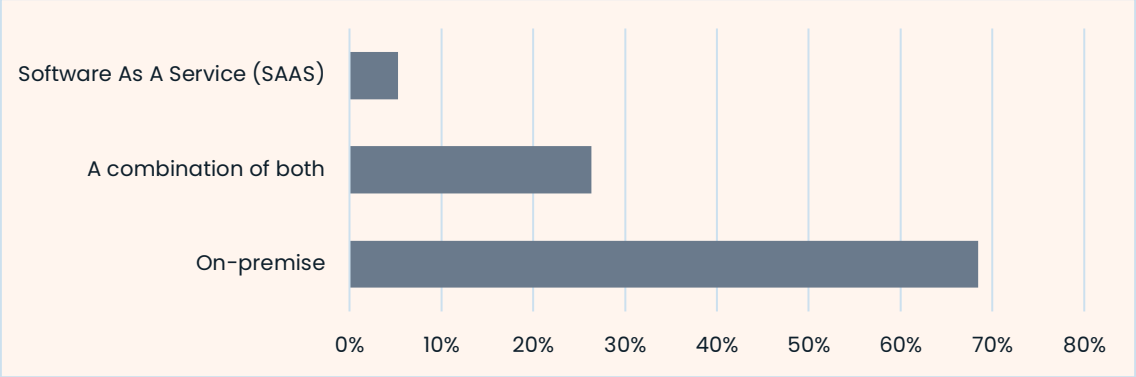


Figure 6-4: Authority enterprise GIS solution hosting

While there are many things that can discourage an organisation from moving to the cloud, we do expect to see more organisations move to cloud hosted SaaS and PaaS solutions over the coming years. Over the last few years, there has been significant support and guidance provided by state and federal governments to move government departments and other government agencies and authorities from on premise deployments of their corporate systems to cloud. While this wasn't always feasible with some vendors taking a while to be cloud ready, this is rapidly changing, so Authorities will start to find that the advantage of cloud will start to outweigh the disadvantages if they haven't already. The NSW government provide clear advice on this subject in their cloud strategy policy[5],

> *"Cloud allows government to transition from the undifferentiated activities of managing infrastructure, to consumption of ICT as a service, allowing greater focus on differentiating services".*

While the Victorian State government has a core set of technology guidelines, including[6],

> *"....adopting a 2-step approach to infrastructure and platform selection: We will design for cloud, only if cloud is unsuitable will we invest in on-premise infrastructure..."*

And another guideline laid out in the Victorian digital strategy is[7]

[5] https://www.digital.nsw.gov.au/policy/cloud-strategy-and-policy/cloud-strategy
[6] https://www.vic.gov.au/a-future-ready-victoria/digital-technology-guidelines-enable-alignment
[7] ibid

"...Look to adapt processes to align with software capability not the other way around".

These types of guidelines and policies are the focus of enterprise ICT managers in every jurisdiction. It will be critical over the next 5 to 10 years for enterprise GIS managers to work closely with ICT leaders to ensure business buy in, but also their move to cloud can occur as seamlessly as possible while making every attempt to maximise the benefits of what cloud can bring.

Corporate Web-GIS Portal

Corporate web-GIS portals that enable staff from across an organisation to find, visualise and report different business data from one map-based platform are a crucial element of digital transformation. GIS web portals typically represent how most people will see and understand GIS at their Authority and therefore should be intuitive and approachable for untrained users. *Figure 6-5* shows 50% of respondents use Esri's ArcGIS Enterprise as their corporate GIS and more than half of those said Geocortex was also part of their Esri enterprise deployments. While the next most prolific was TechnologyOne's Intramaps solution with around 20% market share.

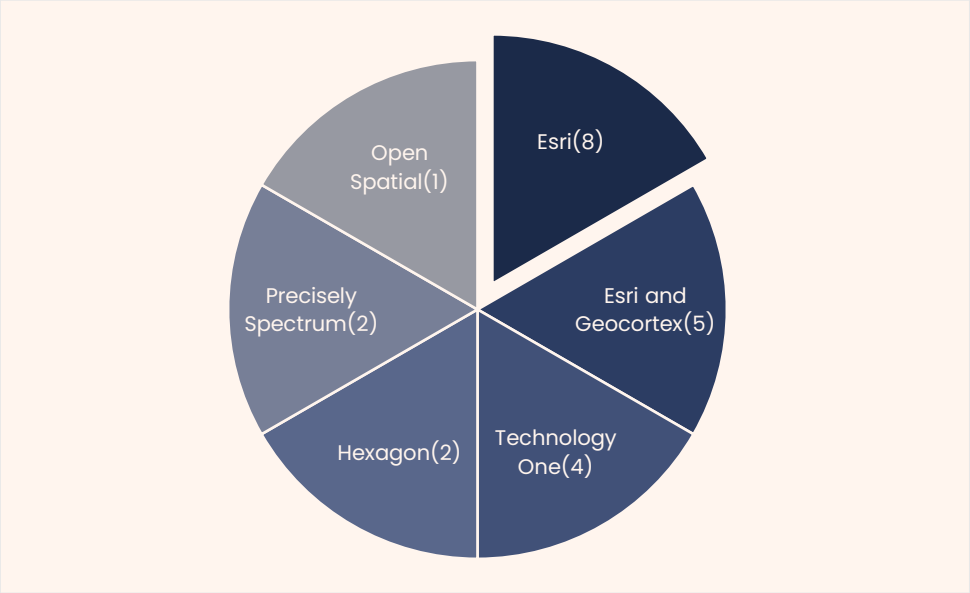


Figure 6-5: Enterprise GIS software vendors

Mobile GIS

Field mapping solutions are used for a variety of reasons within water authorities and the survey highlighted that the main purpose was locating network assets. Field mapping solutions are normally supported by GIS teams. *Figure 6.6* shows the uses of field mapping solutions.

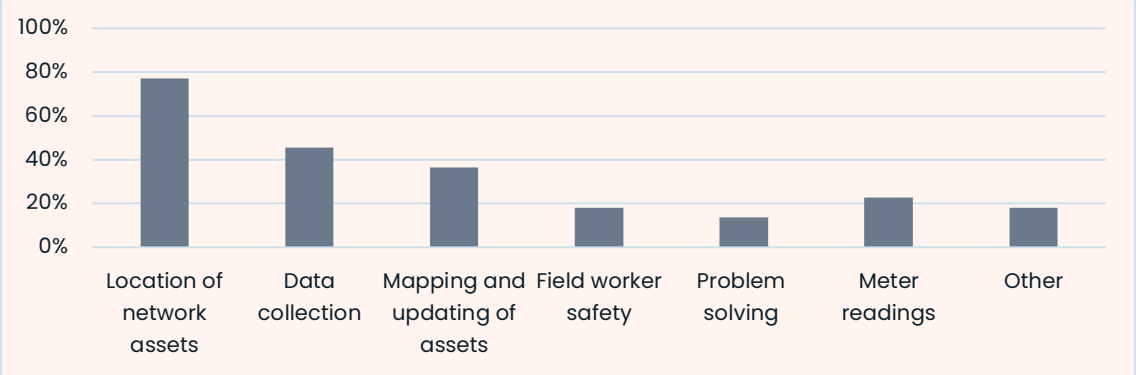


Figure 6-6: Authority rated internal field mapping application purposes

"Other" uses includes asset inspections, weed inspections and route planning (dependant on functionality). Many of the field uses for mobility, may not be true 'GIS' applications provided by GIS software vendors, but may have location data either extracted from the results of the field work from a generic application or fed into other business systems that have developed their own field application that consumes a GIS web service.

Spatial Data

The survey revealed a mixed result when assessing whether spatial data meets needs of the authority. Just 14% of respondents stated that all spatial data meets the requirements. 62% of respondents stated that most spatial data needs are met. *Figure 6-7* provides an indication of the way that survey contributors see the state of the data in their organisations.

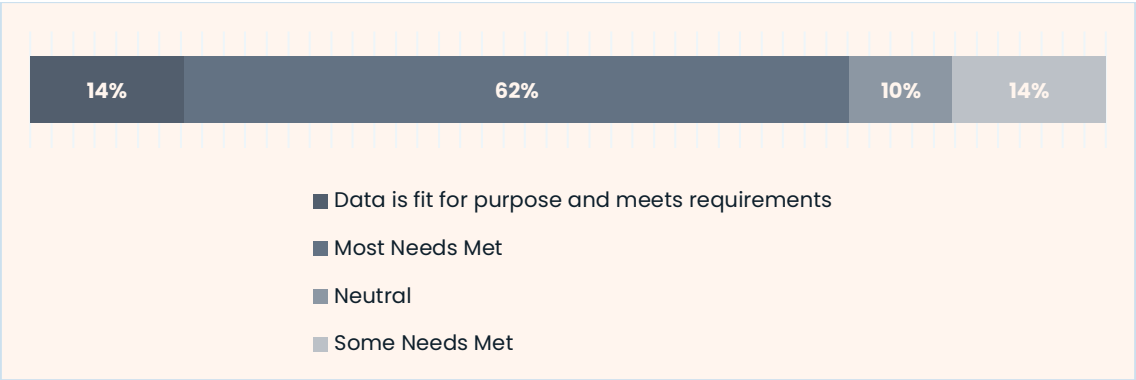


Figure 6-7: Spatial data usability accuracy, currency and attribution

The feedback from respondents highlighted some issues with current data management practices including;

- Lack of coordinated data collection approach
- Lack of accuracy of legacy data
- Currency of data
- Out of data imagery
- Lack of one source of truth for all asset data
- Difficult to discover internal data
- Difficult for external users to access data

- Mismatch between asset register and assets recorded in GIS
- Synchronisation between Asset Management System and the GIS
- Spatial metadata missing
- Transferring CAD drawings and as-constructed developer drawings to GIS
- Lack of executive support for GIS investment

From the overwhelming responses about the most common data challenges faced, it appears that a renewed focus should be placed on understanding the value of the data held by Authorities. From that standpoint a further action might be prioritising steps to ensure the maintenance and appropriate sharing and communication with users of high value data is achieved.

Figure 6-8 shows that most respondents rely on state government data (and updates) for their cadastral land base. Some have said that cadastral data is not adequately meeting needs, which leads to supplementing state cadastre with other data sources. Some land base information is often verified by field survey.

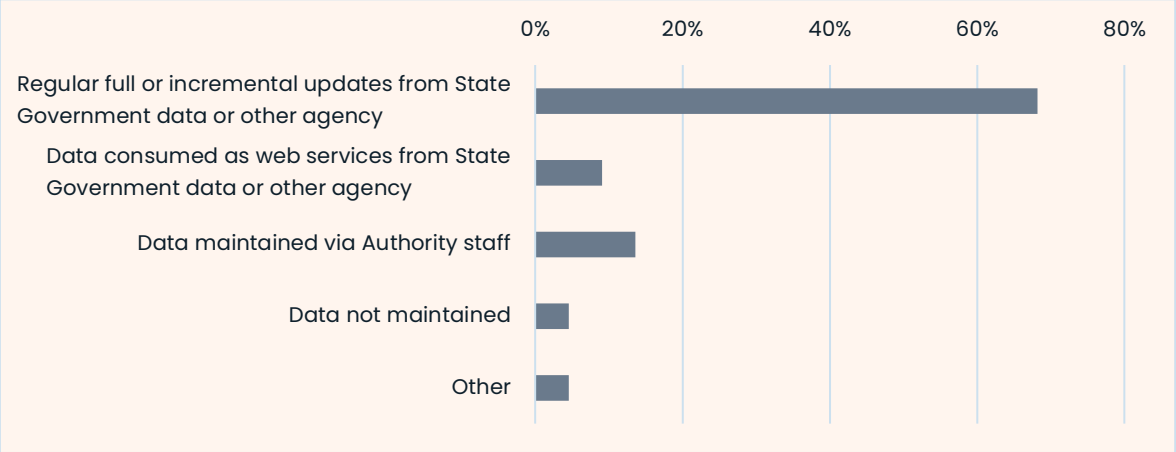


Figure 6-8: Source of Cadastral Data

When asked the top three data issues, the common issues in the responses included:

- Timeliness of receiving "as-built" / "as-constructed" data
- Transferring CAD data to the GIS
- No clear data update process
- Lack of historical data
- Lack of data stewardship and data governance
- Poor asset data attribution
- Disparate and/or duplicate datasets
- Asset location errors

These issues share a common theme – there is room for improved data governance and data management practices.

6.2 Resources & Leadership

Figure 6-9 illustrates the rolled up scores for each authority type for scores given across the Resources and Leadership category, the sub categories include:

- Number of staff in Full Time Equivalent (FTE) roles providing corporate GIS administrative, analytical or user support, spatial application and database services
- Number of staff outside the core GIS team dedicated to data capture
- Level of support by the executive

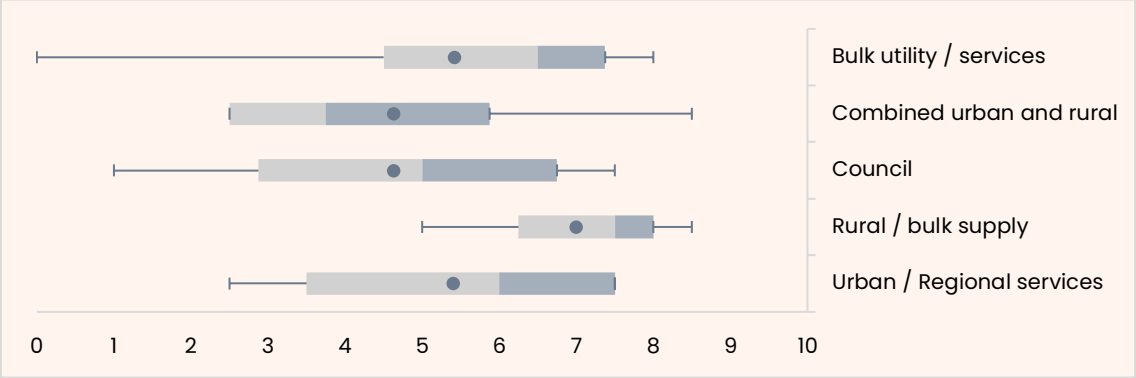


Figure 6-9: Score range across authority type for Resources and Leadership theme.

GIS Staff

The core GIS team delivering GIS services to an Authority will cover a range of vital activities including system administration, analytical services, support for spatial applications, databases, data assurance, business application integration and user support and training. *Figure 6-10* shows there is surprising little difference between the average team sizes between different Authority types, from two (2) to four (4) FTEs, but there is a significant difference in the range with some our largest Authorities at 15 FTEs while some of smallest entities are not able to retain one (1) FTE as a dedicated full-time enterprise GIS administrator.

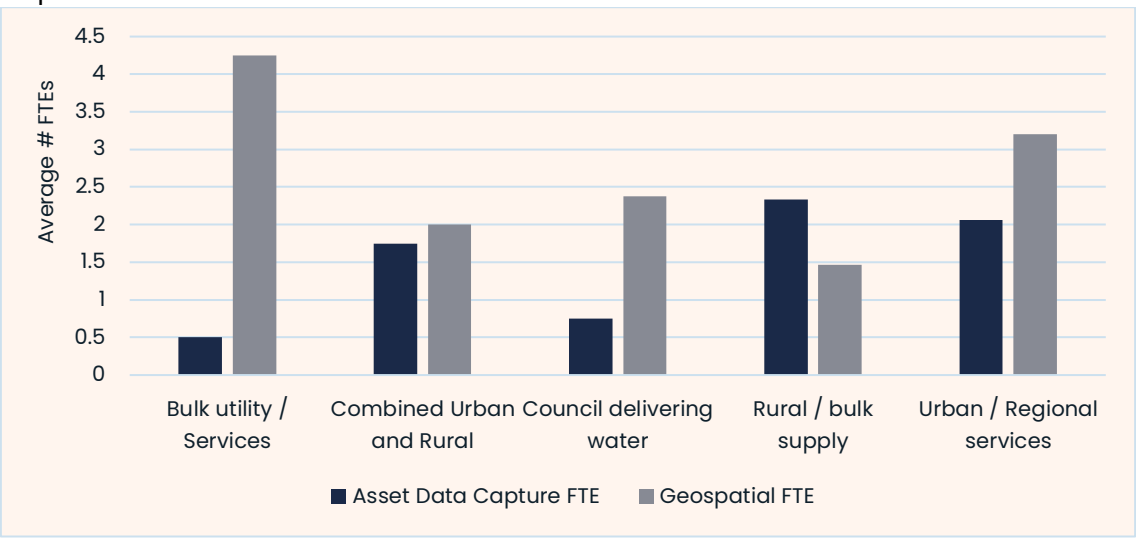


Figure 6-10: Average FTEs across GIS and asset teams, by Authority Type

Looking into the data, where authorities have more area to cover, the data suggests there is a stronger demand for field data workers vs the city or more regional town-oriented authorities.

Executive Leadership Support

A common challenge to many organisations, not only in the water industry, is the level of support from the executive leadership. The level of support is often tied to the awareness of the executive team to the significance of geospatial capabilities to day-to-day operational targets and strategic objectives.

The 2024 results in *Figure 6-11* indicate that overall 73% have demonstrated a high to medium level of support. This is a powerful statement highlighting the significance of geospatial capabilities.

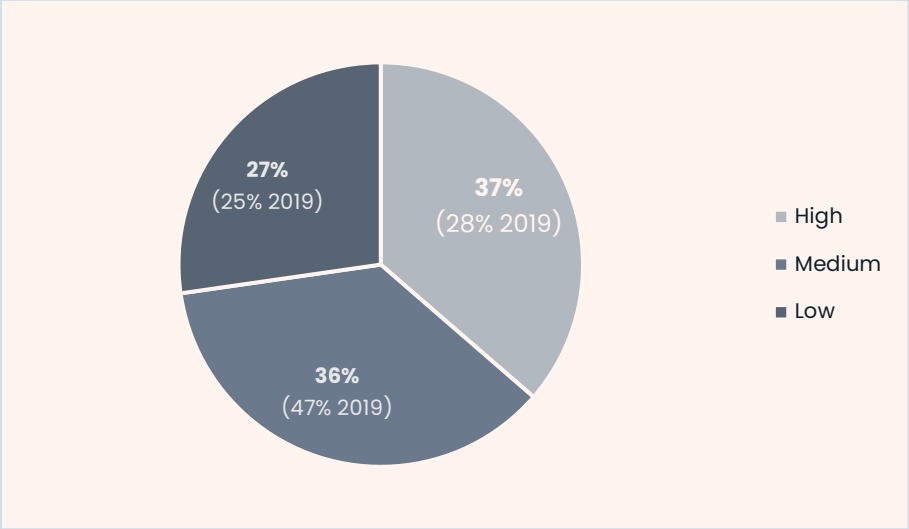


Figure 6-11: Level of Executive Support for Geospatial Capability Investment

The overall result in the 2019 report was reported as similar for lower levels of executive support for enterprise GIS projects, but importantly there has been a shift in support of around 10% from the medium level support into the high level of support. What is clear is that Executive leadership support is critical for GIS teams who are trying to support digital transformation across the business.

6.3 Demonstrated Value

It is important that the investment in GIS capabilities is demonstrating and delivering value to the overall business. *Figure 6-12* illustrates how each authority type compares when the categories measuring level of maturity for Delivering Value are rolled up into a single score. The 'delivering value' questions related to :

- Percentage of staff with access and using the Corporate Web-GIS Portal
- Business Systems integrated with the Corporate Web-GIS Portal
- Public Facing GIS/ Location Services

- Benefits Realised
- Geospatial in 3D or Digital Twin

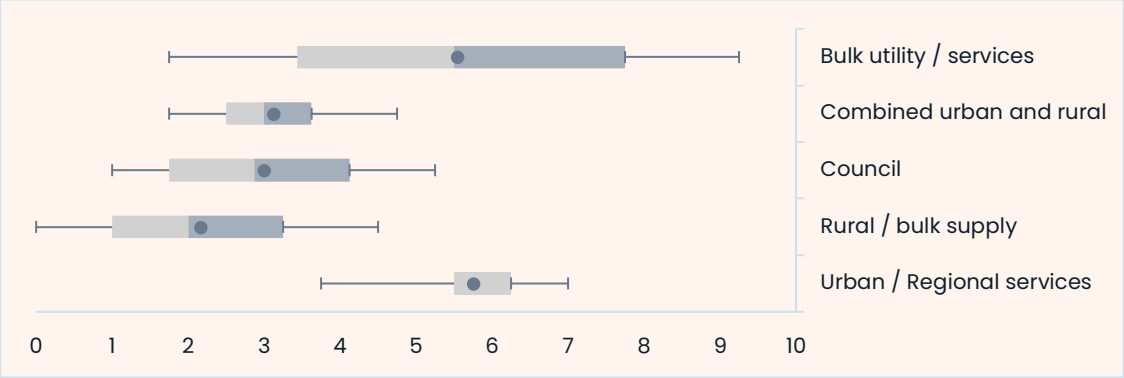


Figure 6-12: Score range across authority types for Value theme

Access and Use of Corporate Web-GIS Portal

Of the average 84% of staff that have access to a corporate web GIS portal, only 50% are reported to be regular users. In some cases, staff do not use GIS web services regularly because they are unsure of how to use it or are not aware of what services are available and how it can add value to their roles. Clearly there are opportunities to deliver training, hold events to raise aware, engage with spatial data users and ask them how GIS could deliver more value and or establish internal GIS User Groups to develop GIS champions in each business area.

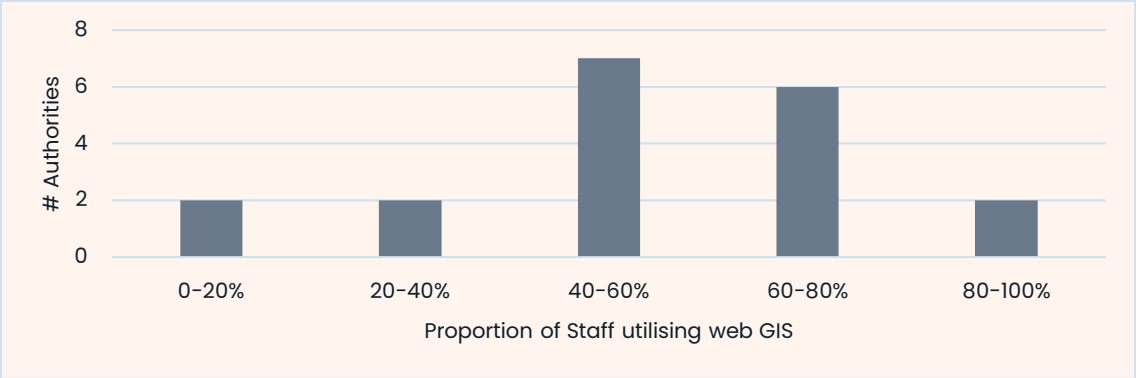


Figure 6-13: Percentage of staff across an authority utilising web GIS

Business Systems Integrated with GIS

The main business systems relied on by water authorities typically include the Asset Management System (AMS), Customer Relationships Management (CRM), Document Management System (DMS), and the Financial and Billing System or Systems.

Integration with GIS is an invaluable way to find individual records by their location or related information or issues presented in another business system. The integrations are increasingly used to discover insights via analysis or business intelligence systems.

The 2024 survey highlights in *Figure 6-14* show that the most commonly business system integrated with the enterprise GIS is the AMS, followed by the customer request system. Integration with CRMs over the last few years has been given higher priority as more than 50% of CRMs are integrated with GIS with a further 20% planned.

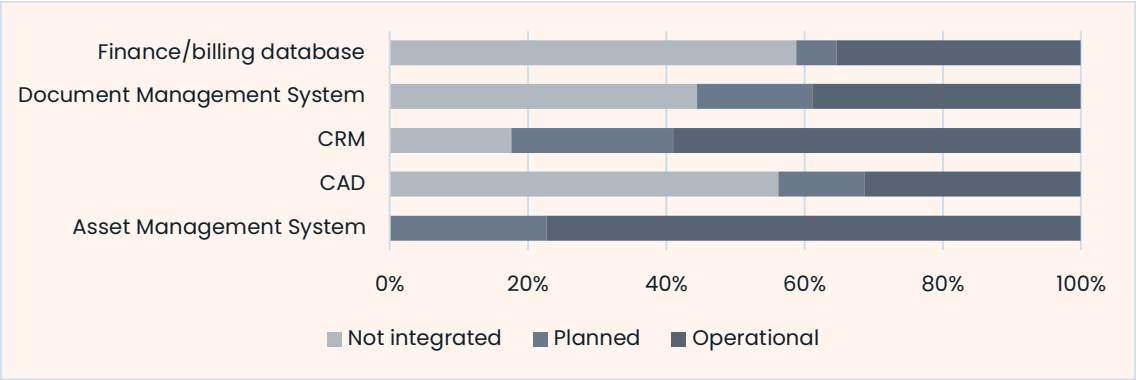


Figure 6-14: Main business systems integrated with GIS

Public Facing GIS/ Location Services

More authorities are providing services to their customers by improving transparency of works and operations. This is achieved through public-facing mapping systems, publishing open data and providing visualisations of assets through 3D models and digital twins.

Public-facing mapping systems can be very effective at delivering support to customers and key stakeholders on a 24/7 basis without the need for staff to answer phone calls and emails. To be effective the data representing the issue or question needs to be up-to-date and the platform intuitive to use. Importantly, organisations need to know what information or questions people are regularly requesting to design the service. A map-based interface may be useful way to represent the information but not always.

The survey data since 2019 shows an increase in the use of public-facing GIS applications from 29% to 50% in 2024. The main purpose of public facing GIS / mapping applications are shown in *Figure 6-15*. Publishing the location of assets is a relatively straight forward task to do and to undertake regularly, particularly with ways of scripting validation and publishing/overwriting webservices. However, 25% of participants have not been able to achieve this outcome due mainly to a lack of resources available to undertake these tasks. Publishing asset data publicly is now commonplace and positively impacts the asset owners by reducing the amount of direct enquiry about the location of assets, while also providing an opportunity for the public to comment on asset locations and attributes – essentially crowd sourcing data validation.

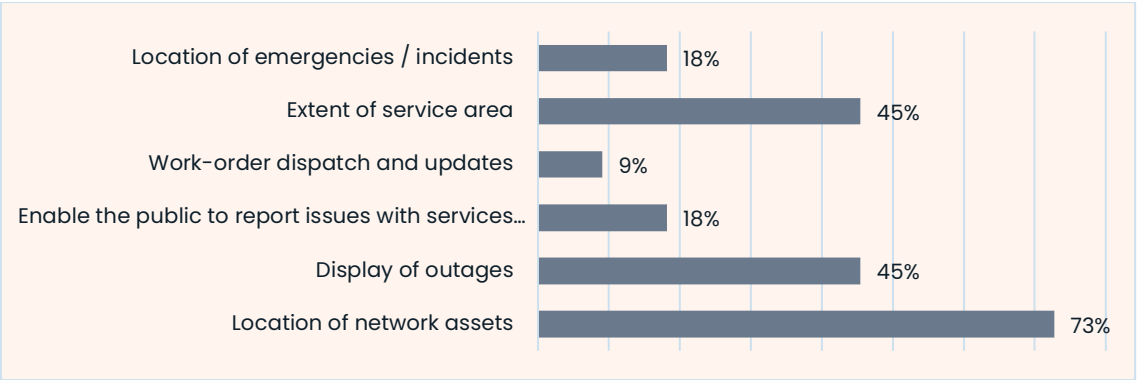


Figure 6-15: Purposes of public-facing GIS applications

Organisation benefit from GIS

The latest response to the question on benefits from GIS indicates the organisations are developing a more sophisticated appreciation of geospatial intelligence. The recognition, at least in some organisations, of the benefits for climate change planning, emergency management, network performance management, customer service and strategic planning is impressive.

Figure 7-16 contains a summary of the main purposes of the enterprise GIS to their organisation.

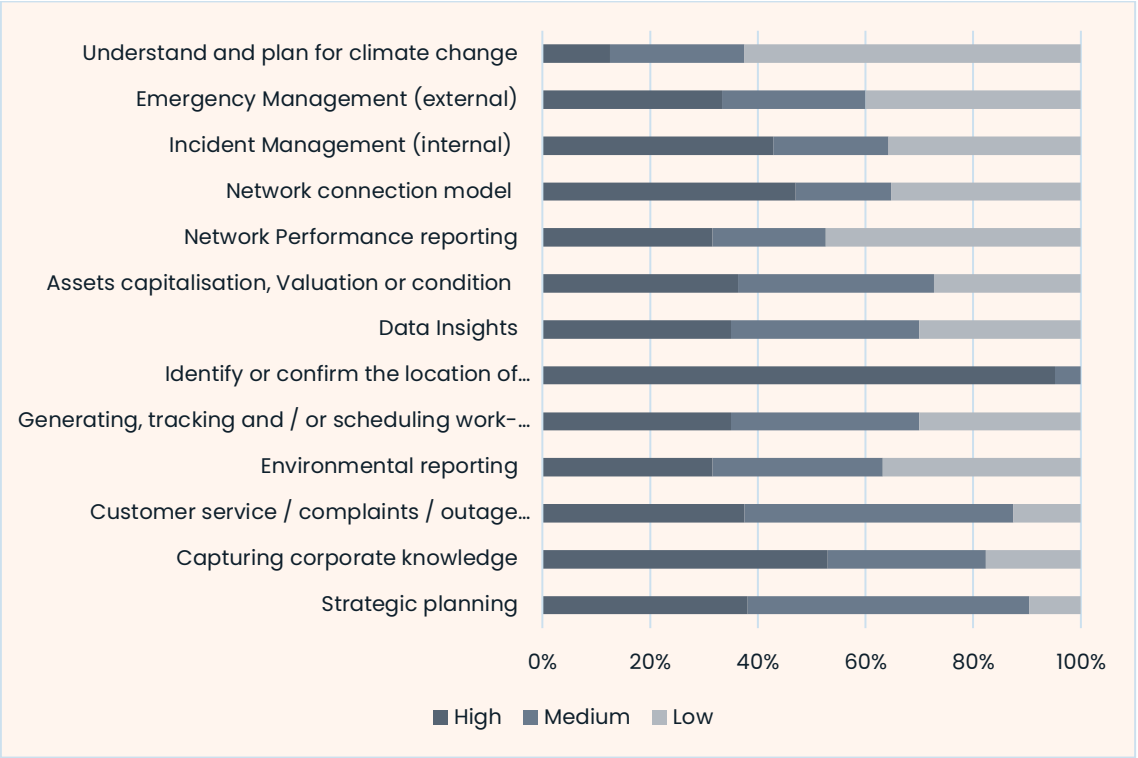


Figure 6-16: Benefits of Enterprise GIS to the Authority

3D or Digital Twin

The potential offered by Digital twin technologies is impressive, but true digital twins in practice have been difficult to successfully implement and prove their worth. Keeping the

models is difficult unless they mandate that suppliers deliver new data in *twin ready* formats, like richly attributes 3d models of new utility infrastructure, instead of a CAD file or PDF of the infrastructure design. Most organisations typically manage their assets in 2D. This has meant that it hasn't been necessary for GIS experts to have technical knowhow for working with 3D data. This is changing.

As capture of 3d content is becoming ubiquitous, LiDAR can be captured very cheaply now using drones and used for developing terrains, flood mapping and other visualisation scenarios. Drones can also cheaply capture photomesh which can be used position assets etc and is really the first steps for most and will be the foundation for understanding what a digital twin could mean for an organisation.

Technical GIS specialists and their associates are becoming more familiar with the use of 3D GIS analysis and 3D data management tools, requesting and converting 3D infrastructure design files like *Revit* or the more open format in *i3s*. Organisation are putting GIS and GIS ETL tools at the centre of the data exchange interface as the rich data contained in 3D models can easily be extracted and either converted to attributes on an asset feature or be used in applications to show digital twins and real time monitoring that is occurring on the infrastructure.

Many blogs, articles and guidelines are written about digital twins that espouse the benefits to utility organisations. An excerpt from one of these blogs exemplifies what many of them say :

> *"Digital twin technologies enable utilities to create readily accessible digital representations of their physical delivery systems — including smart sensors and other connected assets, which might be dispersed across the networks. This may allow them to not only track the real-time performance of these assets, but also to create simulations demonstrating how they will perform in virtually any future scenario"*[8].

In 2019, there was a high degree of anticipation for implementation of Digital Twins with over 40% planning to implement twins but only 3% underway. In 2022 there was a more considered approach towards planning and implementation with 23% planning and 15% underway or operational. Now in 2024 as *Figure 6-17* suggests, we have 17% underway or

[8] https://blog.pureweb.com/how-utility-leaders-can-capture-value-from-digital-twin-technology

operational and only a further 5% in planning. The number one reason for building a digital twin stated by participants was for **visualisation purposes**.

Around 25% of surveyed authorities have either already reached out or have a plan to reach out to other more advanced authorities or state government departments to begin to build up technical capability in 3D and digital twins.

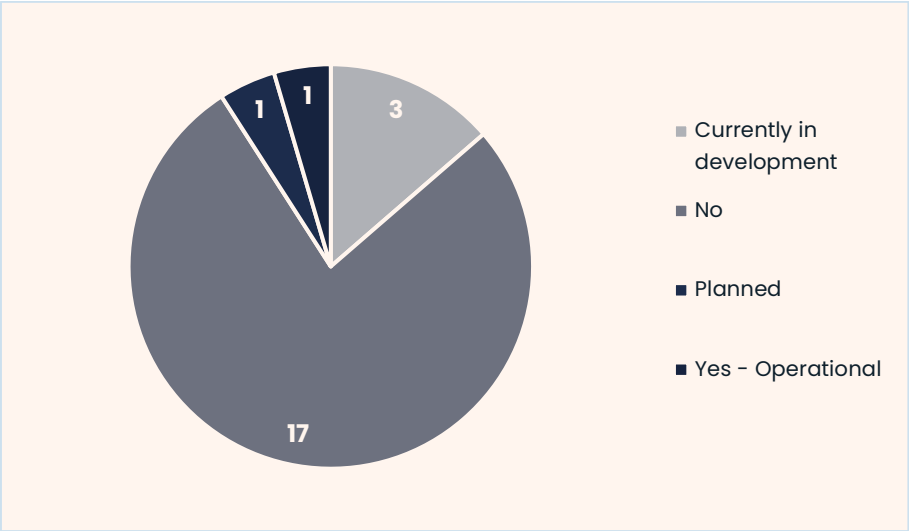


Figure 6-17: Planning to implement a 3D Digital Twin

What are the benefits of digital twins?

Improved performance - Real-time information and insights provided by digital twins let you optimise the performance of your equipment, plant, or facilities. Issues can be dealt with as they occur, ensuring systems work at their peak and reduce downtime.

Predictive capabilities - Digital twins can offer you a complete visual and digital view of your manufacturing plant, commercial building, or facility even if it is made up of thousands of pieces of equipment. Smart sensors monitor the output of every component, flagging issues or faults as they happen. You can take action at the first sign of problems rather than waiting until equipment completely breaks down.

Remote monitoring - The virtual nature of digital twins means you can remotely monitor and control facilities. Remote monitoring also means fewer people have to check on potentially dangerous industrial equipment.

Accelerated production time - You can accelerate production time on products and facilities before they exist by building digital replicas. By running scenarios, you can see how your product or facility reacts to failures and make the necessary changes before actual production.

6.4 Innovation

A mature geospatial environment and supporting capabilities can open organisations up to exploring innovations to generate further business value from existing technology or branch out to access new emerging technologies. *Figure 6-18* illustrates the rolled up scoring by gauging the level of authority led innovation from the following response categories:

- UAV/Drones (either internally or by contractors) Bulk utility
- GIS Integration with Live Systems
- Live operational model or monitoring site linked to geospatial views
- Publishing of open-data or a self-serve data for external stakeholders
- Network assets with 3D attribution
- Geospatial capabilities inform decisions on climate change (not in GDT)

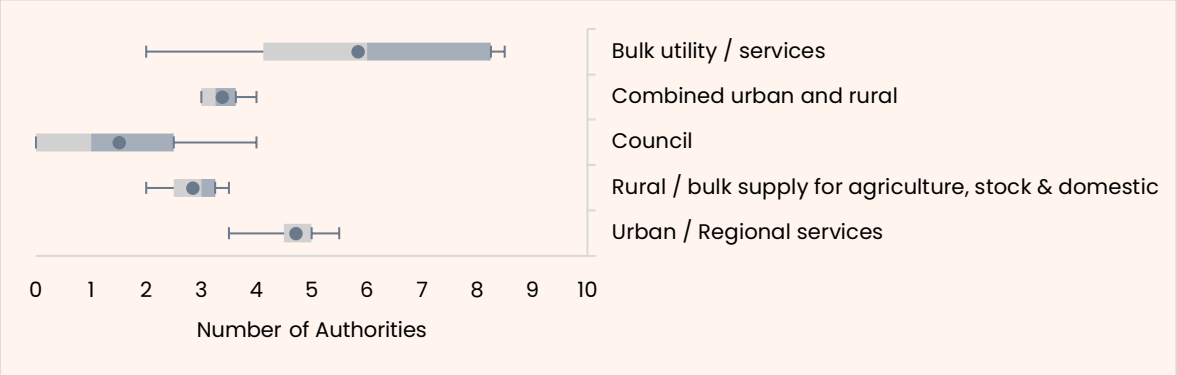


Figure 6-18: Aggregated level of innovative activities undertaken

UAV/Drones (either internally or by contractors)

Given that an Uncrewed aerial vehicle (UAVs) or drone can capture data from the field 30 times faster[9] and more easily than traditional onsite surveying or in person inspection methods, it is not surprising that their use is now well entrenched in many organisations.

The use is only slightly up from 2022, with 82% of respondents using drones in some capacity. Respondents noted that the most commonly used reason for using drones is to review site work and to capture imagery. Other uses include: OHS Surveys, detection of thermal leaks and weed control.

[9] www.drones.gov.au/sites/default/files/documents/validating-the-benefits-of-increased-drone-uptake-for-australia-final-report.pdf

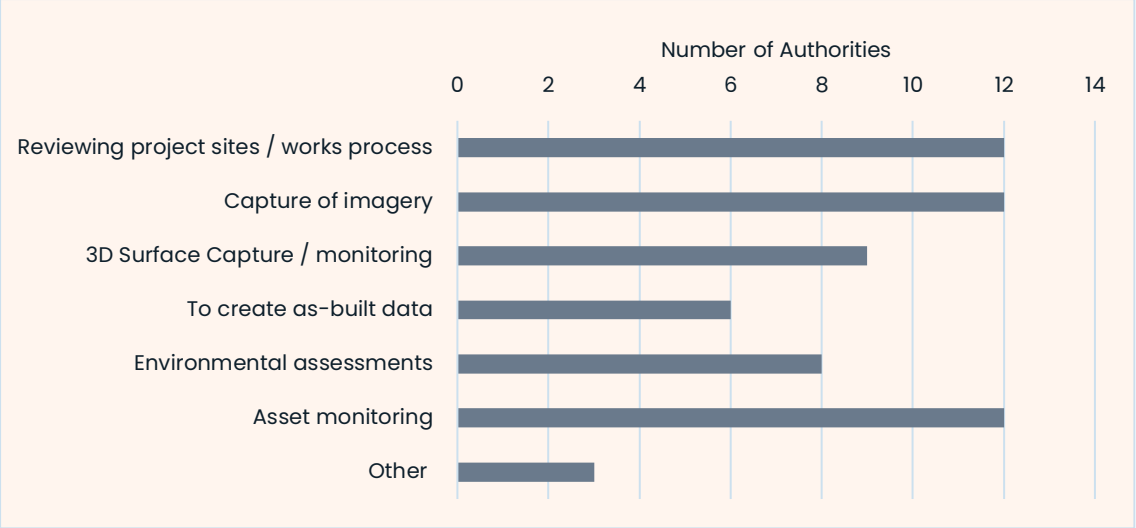


Figure 6-19: Each Authority's purpose (or otherwise) for utilising drones

As drones start to be used for real-time monitoring of sites with live images[10], or for managing an event, it will be fascinating to see how the use of this technology can be incorporated with web and desktop mapping applications by water authorities to enhance either the real-time decision making or post processing of data.

GIS Integrations with Live Systems

Adding geospatial insights to live business systems can provide significant value, however implementation can be challenging. The dynamic nature of live data can it make it especially difficult when new data values are generated every minute or second as can be the case with SCADA and other Internet of Thing (IoT) devices such as meters and weather gauges.

Supervisory Control and Data Acquisition (SCADA) systems are used for controlling, monitoring, and analysing industrial devices and processes. Water authorities often use SCADA to monitor the flow or pressure of water at critical nodes in the network.
Integrating water network data models into your enterprise GIS enables your GIS data to better represent the real-world behaviour of your pipe network. Whilst the models are not live, they are included with the other live systems, SCADA and IoT.
The average results are around 25% which is approximately double the average in 2019 for these integrations.

What is also evident this time around is that advances in cloud and IoT device technologies has made integration with IoT more mainstream with over 20% stating that there is integration with GIS at some level with a further 20% planned.
For other live capabilities like network trace modelling for water leaks or, the share of these types of modelling tools planning to be deployed has been relatively stable, but it looks like there are plans for ~30% of these types of tools to be developed in the near term

[10] https://www.drones.gov.au/sites/default/files/documents/validating-the-benefits-of-increased-drone-uptake-for-australia-final-report.pdf

increasing the value of the existing data as these tools rely heavily on the quality of the underlying network data.

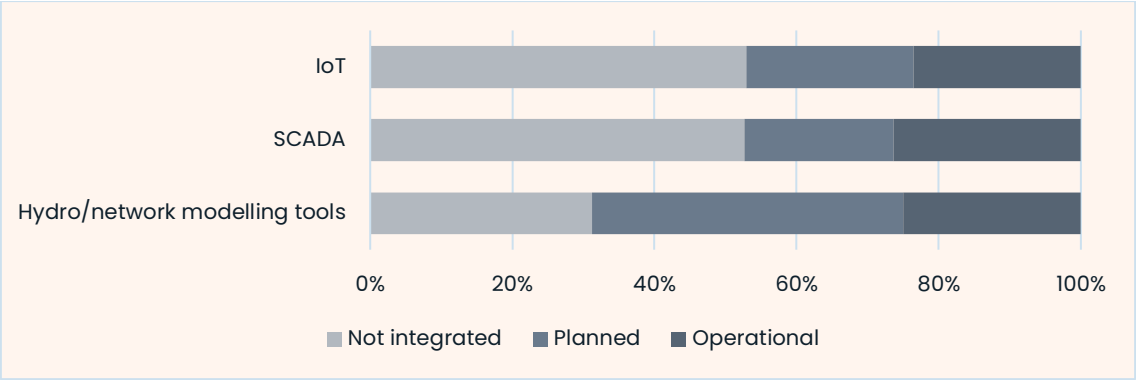


Figure 6-20: Live Main business systems integrated with GIS

Live operational model or monitoring site linked to geospatial views

A live representation of the operational status of assets including SCADA and customer meters can be very powerful especially presented in a combination of dashboard and geospatial views. This remains a stretch target for most authorities with just 27% either actively participating in developing or have developed dashboards or apps containing live map views of one or more real-time data feeds. It was also evident that the majority of the effort in this space is undertaken by the bulk utility and urban authorities.

The technology for consumption of real-time data from sensors and indeed the sensors themselves is still maturing and while there has been a step improvement in recent years it remains a relatively costly exercise to design and deploy and maintain into production. The interoperability between different data sources and platforms is another challenge that is a critical component of this investment to ensure full value is obtain.

Looking ahead, advancements in IoT sensor technologies and big data processing capabilities will mean integration with GIS will increase in demand.

Publishing of open-data or a self-serve data for external stakeholders

The willingness and readiness organisations to publish key spatial data as open and accessible to other organisations is signal of innovation. The data is typically published to the Australian Government website data.gov.au or by the authority directly from their own facility. It is also a pragmatic decision as consultants, government agencies or other parties can serve themselves. The GIS team do not need to manually handle individual requests which can be time consuming.

Impressive to see that publication of open data has jumped from 16% in 2019, 32% in 2022 to 59% in 2024 shown in *Figure 6-21*.

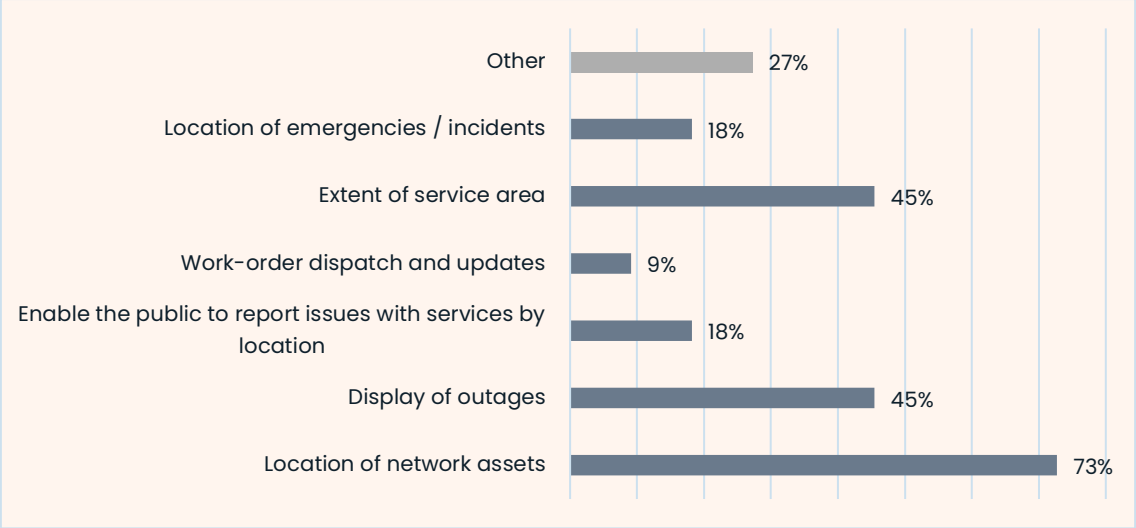


Figure 6-21: Purposes of Authority's public-facing GIS applications

Network assets with 3D attribution

The provision of 3D visualisation and digital twins invariably relies on the network asset data with 3D attribution. To capture the Z element (height) ideally is done at the time of recording new assets or their renewal otherwise it can be an expensive exercise to repopulate existing data with 3d information.

When asked the question about network assets and level of readiness for 3D workflows, 59% of respondents stated their network assets have no 3D attribution at all, with 41% saying partial attribution exists. We expect this number to increase as more authorities commit to digital twin and other 3D initiatives.

There were a number of initiatives mentioned like building approaches to storage and manage BIM models, 3D viewer apps and commencing the journey by starting with the core Digital Engineering strategy. What is clear is that it is difficult to know exactly where to get started with 3D when so much of the information that is managed is laid out in only 2 dimensions. It is typically not been the space for traditional 2D GIS/asset management teams.

The main objective for most organisations will be to develop a strategy with a set of clear and achievable objectives.

These objectives will need to cater for two distinct data channels – **new data and existing data**. For new data coming to an organisation it will generally be as a result of upgrading or building new assets. Working with infrastructure designers to ensure that they are at a minimum providing as-built BIM models as deliverable products instead of CAD or PDFs is a key objective. Another objective for new data delivery will be to develop delivery standards and a way to process BIM models to ensure the effort to convert each BIM model into useable data across GIS and other enterprise business systems remains achievable. New data will require a similar approach for most organisations so some sharing of knowledge will help to by-pass many hurdles for organisations that haven't been able to focus on 3D yet.

For existing data that is managed by an authority, the state of the 2D data may be the determinant of what is achievable in 3D. Some organisations may already have height values as an attribute, but that isn't quite the same as storing the data in native 3D. So assessment of current 2D data will be the most likely first step and then looking at the methods of extrapolating, surveying, or other capture methods to augment that 2D data with a height value. To get these types of projects off the ground, it may be important to provide proof of concepts over a smaller area that can prove up methods and show business leaders that the cost benefit stacks up.

Geospatial capabilities inform decisions on climate change

There are increasing expectations that water authorities will identify the potential risks and opportunities that climate change will present with extreme weather events. Holding reliable location data on assets and their characteristics, customers, future demand forecasts will be crucial to making informed decisions to reduce the risk and impact of climate change on water supply. It is encouraging to see that already ~25% are directly contributing to capabilities to inform decision making using geospatial, while nearly 40% are planning to in the near term.

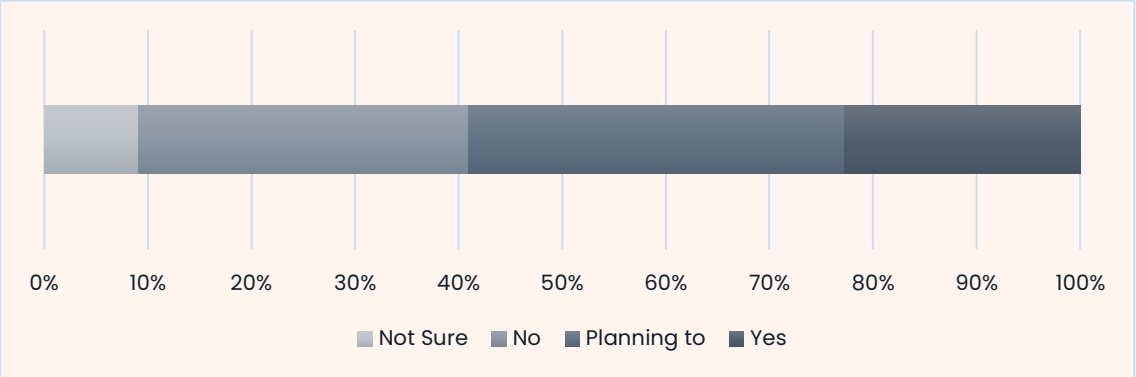


Figure 6-22: Authorities utilising geospatial to inform climate decisioning

6.5 Highlights and Challenges

The main highlight of the last two years for several authorities was the completion of major data transformation projects, including the transition from GDA94 to GDA2020, as-well as the integration of the Victorian Government's Digital Cadastre Modernisation project data.

Implementation of FME workflows, enablement of Before You Dig Australia (BYDA), utilisation of 3D data and launching of web-based GIS platforms / visualisations were also common success stories discussed by survey contributors.

The highlights or "wins" categories achieved across authorities are highlighted in *Figure 6-23*. The summary show that administrators have had a strong focus on data – the most consistent highlight was GDA2020 transformation which most likely has taken time and funding resources away from tasks that have more tangible or visible outcome for users – like 3D treatment plant twins and heat mapping of incident analysis that were mentioned.

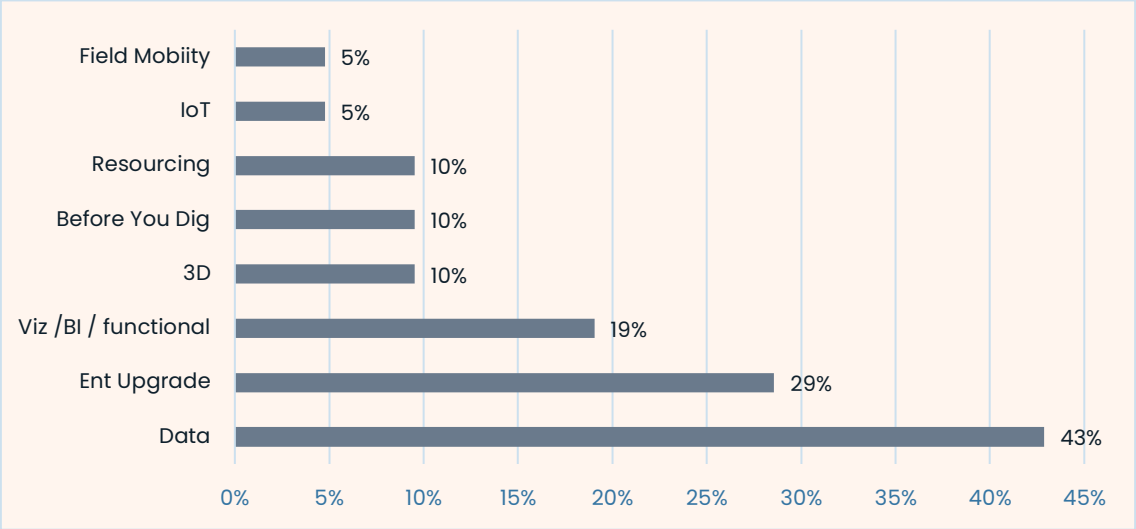


Figure 6-23: Percentage of authorities highlighting achievements in one more category

While some authorities listed an increased investment in their GIS platforms as a highlight from the past two years, an equally common theme was the lack of available trained GIS resources which goes hand in hand with ongoing funding shortfalls and buy-in from business leaders.

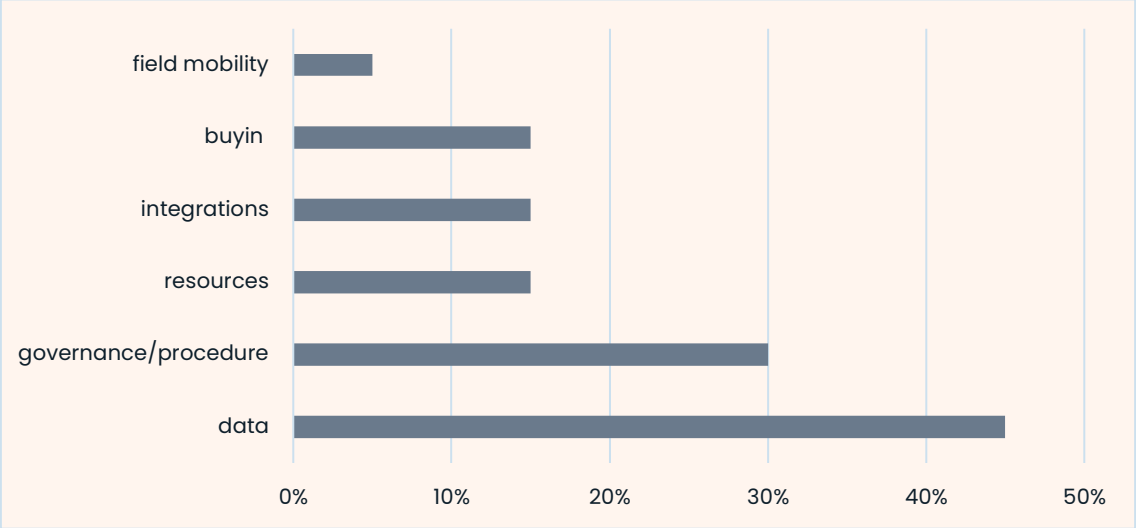


Figure 6-24: Main challenges faced by Authorities

More broadly, challenges are being felt in the areas of spatial data custodianship and governance and procedures, with a broad lack of adherence to, or knowledge of, the data lifecycle. This leads to data currency and accuracy issues, and general unreliability of spatial datasets, which was also a commonly reported challenge. Integration between corporate platforms was another common challenge, which is exacerbated by limited resources to ensure data governance and data maintenance.

6.6 Future Opportunities

Survey participants were asked about future opportunities that Geospatial data and services could provide, which was met with some fairly understandable commentary like more drone usage, more Field Mobility solutions, Common Operating Picture (COP) development, digital twins, integrations, public data sharing, as we as better use of imagery and of course a heavier focus on the data that drives all decisions.

One response to the survey stood out and provides a key message to us all;

> *"The opportunities for GIS into the future are almost endless, but I'm currently too busy with 'business-as-usual' to spend time trying to justify and implement new initiatives"*

It exemplifies a core problem encountered by many Authorities and the difficulties faced in solving the challenges mentioned in the survey particularly with regard to core GIS requirements like data governance, accuracy and currency and field mobility. Without being on top of these core capabilities, new seemingly achievable demands become difficult or impossible to attain. Most often it points, not to a lack of internal capability, but is often symptomatic of a lack of executive and business leader buy-in and support, or an altogether lack of awareness of what benefits GIS brings to each Authority.

These problems can be overcome using a combination of activities which are most often not technically focused – at least initially. The end game is for our business leaders to become 'GIS aware' and embrace GIS by presenting the right information to allow them to make their own informed decision.

Things to consider;

- deliver GIS value proposition and highlight key benefits,
- share stories and showcase peer examples
- explain how your GIS data connects (or should) all the business systems together
- don't talk too much GIS jargon and share successes often

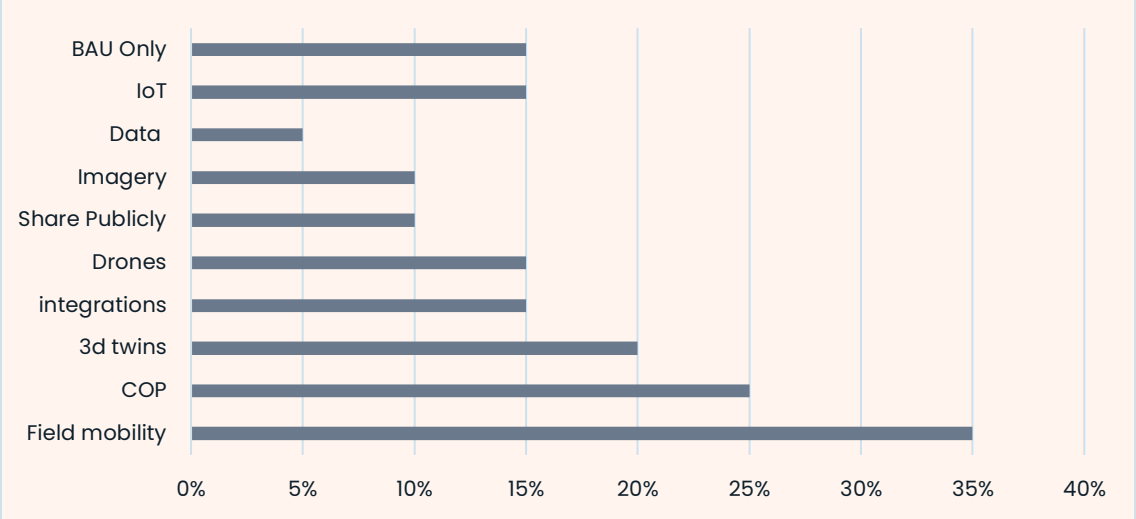


Figure 6-25: Percentage of authorities nominating opportunities to uplift their GIS

7 Geospatial Digital Transformation Readiness

The Geospatial Digital Transformation (GDT) measure is the combined score for each of the four key areas. Each of these areas from Data & Technology through to Innovation represent consecutive levels of maturity of investment and thinking of organisations. A strong foundation in Data & Technology and Resources & Leadership comes before organisations can truly deliver high levels of Demonstrated Business Value and Innovation. Overall, GDT scores vary significantly depending on the type of authority.

The digital transformation of the water industry is vital to continue to meet the expectations of continued productivity reform, efficiency dividends and customer expectations. Digital transformation is not new, dealing with the pandemic highlighted the importance of being able to continue to deliver reliable service with remote workforces.

Integrating digital technologies across an authority can deliver a range of benefits:

- Data collected is optimised for insights, field efficiencies and safety
- Greater visibility of resources hence better management
- Better customer experience
- Increased collaboration and innovation
- Improved productivity

Industry GDT scores

These scores are how the entire industry faired across the various authority types versus the survey response categories. The evidence collected in the current cohort of surveys shows that geospatial readiness is highest in the Bulk Utility/ Large Service authorities and lowest in the Council and Rural only Authority types.

Authority Types	Data & Technology	Resources & Leadership	Demonstrated Value	Innovation	Overall GDT
Bulk utility / Services - managing and/or delivering to large area or statewide	7.9	5.4	5.5	5.8	24.7
Combined Urban and Rural for agriculture and township services	7.5	4.6	3.1	3.4	18.6
Council delivering water	6.6	4.6	3.0	1.5	15.7
Rural / bulk supply for agriculture, stock & domestic	5.0	7.0	2.2	2.8	17.0
Urban / Regional services	6.6	5.4	5.8	4.7	22.4

The variation between authority types may reflect their differing capacity to invest in people, data and technologies. The large Bulk utility/ service authorities were clearly the most GDT mature, with consistently high scores in all areas.

GIS Water User Group (GWUG)

We encourage readers to share this report with colleagues. We look forward to seeing you at the next GIS Water User Group meeting and connect with other geospatial professionals across the water industry.

The National Water Industry GIS Capability Survey is designed to assist water service providers to benchmark their current focus and investment in geospatial capabilities against similar organisations and the entire industry. In the context of this survey, geospatial capabilities refer to GIS and geospatial enabled systems, data, processes and supporting resources.

Spatial Vision

Spatial Vision has worked with clients in the water industry for almost twenty years. We use this experience to provide bespoke services to support authorities along their digital transformation journey and day to day support.

Our deep GIS expertise includes Esri suite, VertiGIS / Geocortex, FME, QGIS and other open-source technologies.

Our services include;

- Strategic advice, including geospatial capability roadmaps
- Procurement requirements
- GIS System Architecture review
- Enterprise GIS design, deployment, customisation and support
- GIS training
- Operational support to GIS teams
- Data automation and engineering
- Custom IT applications

- Climate Change Risk Assessments and Advice

Further information

This report presents the outputs and findings obtained through the 2024 National Water Utility GIS survey conducted by Spatial Vision.

For further information about this report or if you'd like to participate in the Geospatial Water User Group, please follow Spatial Vision's website or reach out to Graeme Martin, graeme.martin@spatialvision.com.au

A huge thank you to all contributors.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Vision