

## CASE STUDY

### Data and research as key enablers of city outcomes: A case study of the City of Cape Town (2000-2022)

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Natasha Primo joined the City of Cape Town in January 2011, where she is the Head: Organisational Research in the Policy and Strategy Department. Among others, she is responsible for overseeing and setting in place components of the City's research implementation framework and research knowledge management. This includes serving as a research consultancy for line departments, coordinating a transversal research community of practice, and leading a cross-functional process for SDG localisation in the City. Before joining the City of Cape Town, she worked in the non-profit sector on ICT4D and regional internet policy, research and advocacy.

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## ACKNOWLEDGEMENTS

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## Overview

Smart cities and evidence-based decision-making have become increasingly popular narratives in the information age, with city councils around the world looking to make use of data and research to improve the delivery of services and make more informed decisions. Together, they can improve efficiency, resource allocation, and project evaluation. However, investments in such reforms can also be expensive, and cities need to ensure these reforms are fit for purpose.

This case study explores the evolution of using data and research, enabled by technology, to improve outcomes in a city that has taken a pragmatic approach in this regard: the City of Cape Town (CCT) in South Africa. **Figure 1** below outlines the size, income levels and the integrated structure of the City.

The story begins at the start of the City's official journey in 2000, when 7 disparate municipalities were merged into one 'unicity' (shown in **Figure 1**), and follows significant reforms that have enabled the improved use of data and research to achieve city outcomes over a 20-year period.

**Figure 1: Pre- and Post-UniCity Map<sup>1</sup>**



Cape Town, as of 2021, has a population of an estimated 4.6 million people<sup>2</sup>, with an annual City budget of around R12,302 (US\$ 715) per capita<sup>3</sup>. The City is also relatively unique in that almost all service delivery functions (including water, sanitation, electricity, transport, waste, infrastructure, public spaces, and more) are within its mandate and housed within the one organisation, making information sharing more feasible than if they were in multiple distinct agencies.

- 1 Sourced from City of Cape Town Information and Knowledge Management Department (2022), City Maps.
- 2 City of Cape Town Policy and Strategy Department (2021), *Overview of Demographic and Socio-economic Characteristics of Cape Town*.
- 3 Adapted from City of Cape Town (2021), *2021/22 - 2023/24 Budget Annexure A* [https://resource.capetown.gov.za/documentcentre/Documents/Financial%20documents/AnnA\\_2021-22\\_Budget.pdf](https://resource.capetown.gov.za/documentcentre/Documents/Financial%20documents/AnnA_2021-22_Budget.pdf)

A **timeline** of the various **CCT reforms on data and research, and associated IT infrastructure and information and knowledge management approaches**, is displayed in **Figure 2**. The timeline also highlights the 5-year election and Integrated Development Planning (IDP) cycles, as well as the broad contextual changes occurring at the time, that often played a large role in catalysing certain projects or reforms. These include the global policy narratives around smart cities and the knowledge economy in the early 2000s; the 2010 FIFA World Cup; the City being named the World Design Capital in 2014; and then two crisis events: the 2017 drought, and the Covid-19 pandemic.

The reforms are grouped into 'eras', loosely following the structure of the case study.

**Section 1** of the case study explores how the City **built the Information and Technology (IT) infrastructure for improved administration and service delivery**. This was the primary focus of the first few years after the UniCity was established, and enabled the generation of vast quantities of data and information in a digital format.

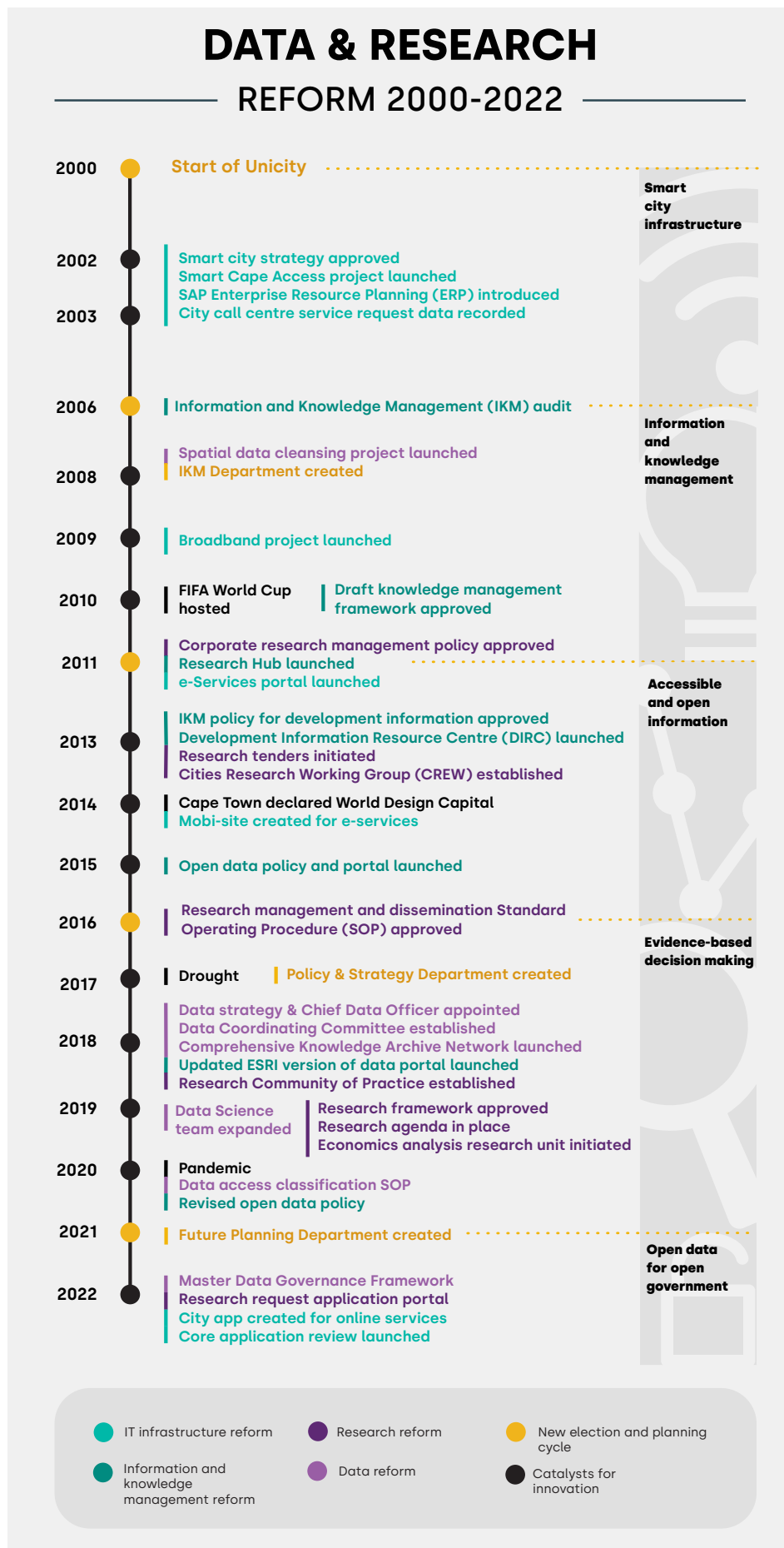
**Section 2** covers the reforms to centralise, share and better manage information - including data and research - through establishing an **Information and Knowledge Management (IKM)** department. In the earlier part of this era, the focus was largely on consolidating and centralising information internally. But as time passed, this shifted to a more holistic and integrated approach, looking to share the City's information more broadly with the public, and also to better manage, leverage, and apply the research and data work being done externally to the City.

**Section 3** then looks at **how data and research are being used to guide decision making**, spurred on by the organisational transformation at the time, which emphasised the role of evidence-based decision-making, valuing data as an economic asset, and the creation of more transversal policies in the City. A new era is now emerging on 'Open Government', to ensure citizens are better included in the generation of evidence and feeding into decisions.

The key lessons for other cities are detailed in the final section, and include:

- Don't let technology drive your business.
- Pro-actively monitor and adapt to the rapidly changing technology landscape.
- Invest in a variety of in-house capabilities – not only to support data, research and technology initiatives, but also to hold service providers to account.
- Ensure all systems and their data are designed for integration and sharing from the outset.
- Data, research, and IKM should be embedded as key roles and activities in supporting service delivery and infrastructure investments
- Leverage moments of change to advance innovation, and make sure to institutionalise successes across the organisation.
- Understand the 'digital divide' in your city.

**Figure 2: Timeline of data and research reform in the City of Cape Town (2000-2022)**



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# 1. Building the IT infrastructure for improved administration

Before the merger of the 7 municipalities into the City of Cape Town (CCT) 'UniCity' in 2000, operations were largely carried out manually using hard-copy documents. Computer systems, where used, were limited in function and were using data that was 3-6 months old. Processes for overseeing data, research, and related functions were also not consistent across the pre-unicity municipalities.

The new CCT in 2000 was larger and more complex to manage, rivalling some of the major corporations in the country. Real-time data was needed to understand and manage the various constituents and their complex, moving parts. Business processes needed to be mapped and aligned, and systems for automating, managing, and storing information needed to be sourced. Information and knowledge management tools and principles needed to be prepared and accepted internally.

The vision was for ICTs to enable local government to deliver services more efficiently to its population, and to empower its population to participate in the growing knowledge economy.

A **Smart City Strategy**<sup>4</sup> was developed and approved in 2002, and set out to prepare the City for the information and technology transformation needed to reorganise City processes. The vision was for ICTs to enable local government to deliver services more efficiently to its population, and to empower its population to participate in the growing knowledge economy. This would require a radical revision in City staff's capabilities to use IT systems, and in the City's ability to deliver information in electronic form to its population – a bold move at a time when the internet was in its early phases in South Africa, email was nascent, there was no Wi-Fi, and IT was still a very new concept to most people.

At first, there was some internal resistance. The strategy was described as too ambitious, and so it had to be broken up into smaller, one-year time frames. The **Smart City Steering Committee (SCSC)** was established to provide high level oversight of the initiatives, bringing in external perspectives. The **Smart City Working Group (SCWG)**, a cross-departmental team, worked to demonstrate the vision to non-IT departments.

Many of the successful programmes and projects that follow below were set in motion as a result of the Smart City Strategy, including:

- The City-wide enterprise resource planning (ERP) system (SAP<sup>5</sup>),
- Projects to better connect the wider city, such as the Smart Cape Access Project and the Broadband Project; and the development of e-services.
- The Integrated Knowledge Management (IKM) initiatives.

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4 City of Cape Town IT Directorate (2002), *Smart City Initiative from Planning to Co-ordinated Implementation*.

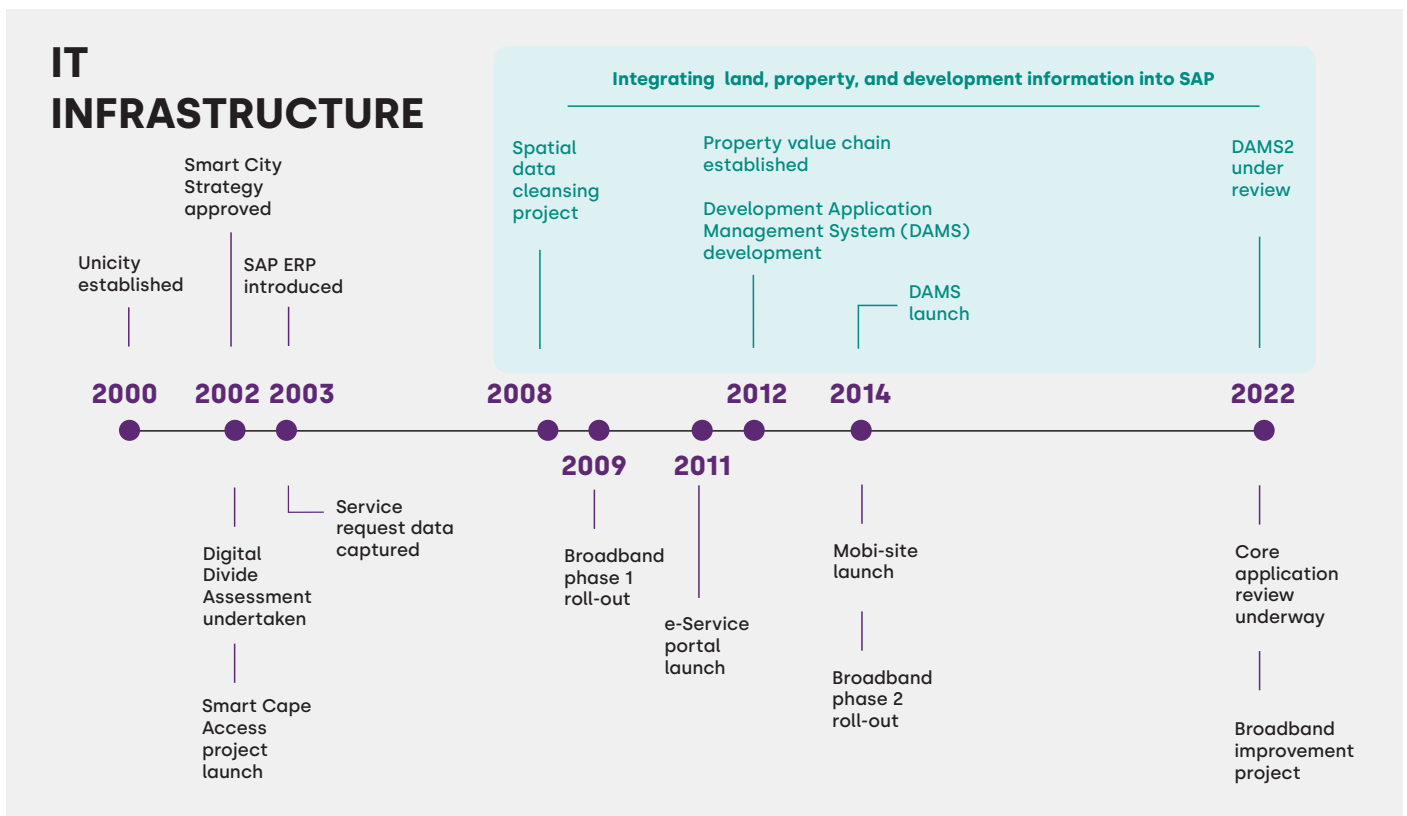
5 SAP, as the ERP is known, is the name of the service provider, formerly known as System Analysis Program Development.

While the strategy focussed on achieving internal administrative efficiency, it also strove to derive more value from data in strategic decision-making and service delivery. The Smart City Strategy and its related initiatives received much global recognition, including the 2004 '21st Century Achievements Award' from the Computerworld Honors Program<sup>6</sup>, and the 2002 'African ICT Achievers e-Government Award'.<sup>7</sup>

'21st Century Achievements Award' from the Computerworld Honors Program, and the 2002 'African ICT Achievers e-Government Award'.

## Enterprise Resource Planning and IS&T systems

**Figure 3: Timeline of IT Infrastructure reform in the City of Cape Town (2000-2022)**



The organisation-wide integration of the **Enterprise Resource Planning (ERP) system (SAP)** between 2001 and 2003 brought the electronic infrastructure outlined in the Smart City Strategy. One automated system would now manage the City's business processes, enabling a transition from the previous disjointed, paper-based system to a comprehensive, more integrated system with enhanced transparency within and between departments. With digitised records and systems, data and information would now be available in real time for faster operational decisions.

<sup>6</sup> Computerworld (2004), Computerworld Honors: Innovative IT Success stories touted <https://www.computerworld.com/article/2565557/computerworld-honors--innovative-it-success-stories-touted.html>

<sup>7</sup> Bridges.org and City of Cape Town (2002), *Taking Stock and Looking Ahead: Digital Divide Assessment of the City of Cape Town*.

CCT was the first South African city to embark on a City-wide SAP roll-out. Strong leadership was required to drive forward the bold vision, manage the transition to such a system, and ensure cross-department commitment and collaboration.

The first functions integrated onto SAP included key business processes of Finance, Human Resources (HR), Billing, and Plant Maintenance, providing a strong foundation for all additional applications, with direct links to revenue streams. Different modules were then built and added to expand its functionality over time. For example, after a rigorous data cleansing process, development and property management data was added in 2012, as described in the use case below. Since 2013/14, the transport department has also used SAP to receive real-time notifications of infrastructure failures.

Each new application in SAP required customisation, needing capacity to be built internally not only in adjusting to using SAP for business functions, but also for a specialist team with the skills to develop and adapt applications. Staff were trained on advanced SAP functionality, to increase the usability of the system and improve the quality of decisions made using the system's data.

Working groups were also held with senior management, to deepen their understanding of the information that was going to be available to them through the system, and their ability to access and interpret this information. At one point, there were over 180 people - consultants and City officials - working on the project. These were not IT officials, but rather people from line and other departments with strong domain expertise.

The all-consuming and time sensitive nature of the project meant that it crowded out other work - both in terms of the capacity required to implement it, as well as the large up-front costs of investing in such a system. At the time, the overall budget for the SAP implementation was about R300 million<sup>8</sup>, resulting in a 39% increase in the Strategy and Policy unit budget in the 2003/4 financial year.<sup>9</sup>

However, this amount was quickly recouped through improved revenue for the City. The City's estimated financial benefits of the SAP integration for IT, procurement, and staffing are shown in **Table 1** below. SAP also successfully simplified and unified business functions across the organisation, improving the visibility and monitoring of administration data (finance, income, supply chain management, and HR data), strengthening governance, and entrenching deep cross-departmental working relationships.

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8 Adapted from City of Cape Town (2003), *Enterprise Resource Planning and Change in the City of Cape Town* [PowerPoint slides].

9 City of Cape Town (2003), Integrated Development Plan [https://www.westerncape.gov.za/text/2004/2/cape\\_town\\_draft\\_idp2003-2004.pdf](https://www.westerncape.gov.za/text/2004/2/cape_town_draft_idp2003-2004.pdf)



The system also built trust, and was one of the key contributing reasons that the City is one of the only cities in South Africa to have unqualified audits (an audit with no material misstatements i.e. incorrect or omitted information<sup>10</sup>) for so many years.

**Table 1: SAP integration influence on the City's revenue (as per CCT 2003 estimates)<sup>11</sup>**

|                    |                                   |  |
|--------------------|-----------------------------------|--|
| <b>IT</b>          | R60 million per annum saved       | Various legacy systems replaced                          |
| <b>Procurement</b> | R40 million per annum saved       | Consolidated procurement and improved stock holding      |
| <b>Staffing</b>    | R20 million per annum to be saved | Natural attrition of staff, reduced duplication of roles |

Notwithstanding this success, having one comprehensive system that required customisation for each new function brought some challenges as well. Some departments, who were not included early enough in the SAP migration, ended up taking on systems external to SAP, creating challenges around integration. Other departments who built on and customised modules within SAP experienced large time-lags, and later as technology evolved, had difficulty finding people with the necessary skills.

The more the City customised, the greater the cost was in maintaining the solution. Given the large investment made in SAP, the City was also somewhat "locked in", and over time could not easily leverage more dynamic and novel systems that were being innovated.

When SAP was initially invested in, the focus of the project was on business process re-engineering. These processes were then automated or 'hard-wired' by the technology, rather than the technology itself being the solution.

Each external consultant providing guidance on the technology was partnered with a City official with domain expertise to ensure that solutions were closely linked to City needs. In-house expertise was built, reducing the reliance on vendors who may not understand core City business. However, some stakeholders stated that over time the importance of having business processes at the heart of technology was forgotten – the SAP support desk became more of an IT function that understands the technology, but not the business of the City.

As the needs from technology in the City have changed over time – from solely automating business processes, to wanting to utilise data generated to inform broader strategic and operational decisions – further challenges were faced. The system was not designed with extensive data integration and extraction across modules in mind, requiring concurrent use of SharePoint for manually sharing data and

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<sup>10</sup> Auditor General South Africa (n.d) Audit terminology <https://www.agsa.co.za/AuditInformation/AuditTerminology.aspx>

<sup>11</sup> Adapted from City of Cape Town (2003), Enterprise Resource Planning and Change in the City of Cape Town [PowerPoint slides]. (Note: These are CCT estimates from 2003, the IGC does not have access to audited figures).

information. This also inhibited automating uploads of data to various portals, such as the Open Data Portal described in Section 2. Data from outside the system could also not easily be added in, limiting how the data could be combined and manipulated to provide new insights.

With the SAP contract nearing an end, the City is currently (2022) undergoing a **Core Application Review (CAR)** process to assess whether the current system is still the best fit for City needs, given the high cost and some of the challenges experienced, as well as new alternative technologies that have emerged. The CAR process is looking at which of the City's core systems (SAP, Microsoft, and GIS) will need to be migrated to new systems in the market, and which will need to be updated to newer versions of the same system. It will include a review of capabilities required and governance structures to facilitate new systems and technologies.

**As development management is a core City function, more integrated and holistic approaches and systems were needed, and it was prioritised for integration into SAP.**

This will allow, for example, the City to look at using more agile and intuitive software solutions already tailored for specific functions where appropriate, as well as systems that allow for better data integration. One challenge, however, is that it is very difficult to do a socio-economic assessment of these technologies, and their anticipated influence on issues that residents and businesses care about such as administrative efficiency.

#### **Use case: Integrating land, property, and development information into SAP**

Pre-Unicity, each municipality's land and property data ran on separate systems, creating silos across the City, resulting in data inconsistency between departments, incomplete and inconsistent information, and delays in data capturing and cross-departmental process handovers. The history of apartheid segregationist land-use planning also contributed to these inconsistencies and missing land and development information for Cape Town. Citizens' interactions with the City on land, property, and development was also manual and paper-based, with long lead times in decisions and approvals.

As development management is a core City function, more integrated and holistic approaches and systems were needed, and it was prioritised for integration into SAP. There were three phases of work to achieve a modern development management system:

- 1. A spatial data cleansing project** (2008-2010) was led by the IKM department, together with the ERP branch of Information Systems and Technology (IS&T), to centralise and integrate property-related data. Spatial data was integrated erf-by-erf<sup>12</sup> on GIS (ESRI)<sup>13</sup>, and non-spatial data was added as a new module on SAP, SAP-LUM (Land Use Management). Clients, billing and income data were also

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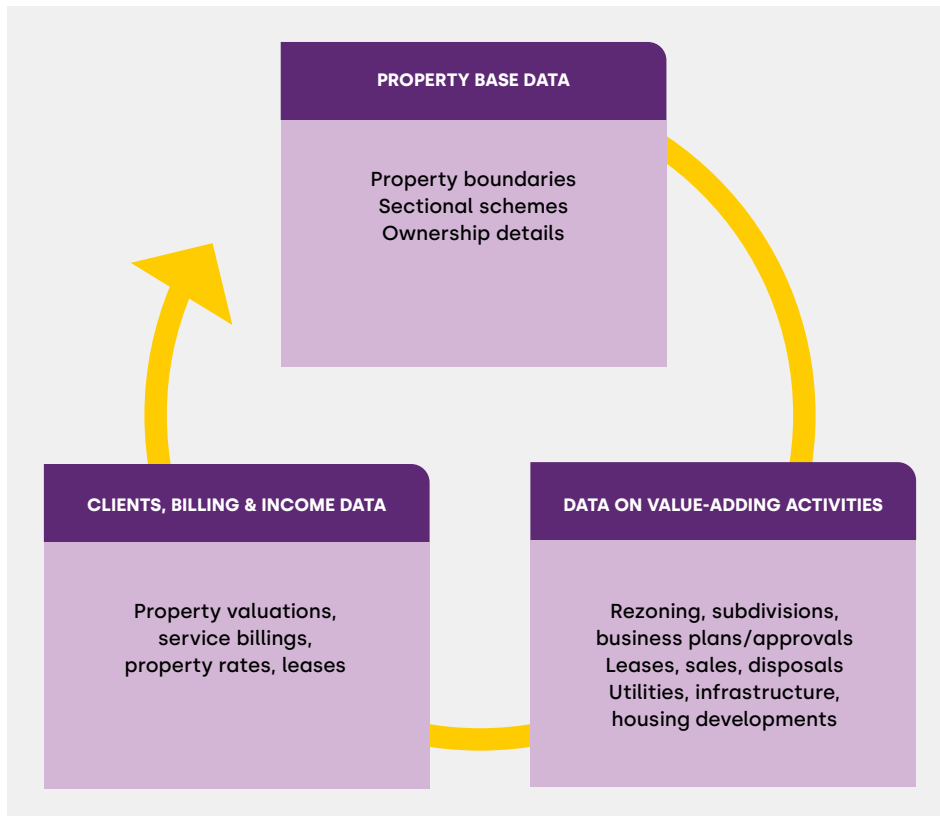
<sup>12</sup> 'Erf' is the legal terminology used to refer to a plot of land in the South African context, derived from Afrikaans origins.

<sup>13</sup> Environmental Systems Research Institute (ESRI) refers to the supplier of Geographic Information System (GIS) software.

migrated to SAP and/or ESRI-compatible systems as part of the data cleansing project.

- 2. A Property Value Chain (PVC)** was established in 2011. This brought the above information together, at the transactional level, for the integrated management of properties across all functions—from plan approvals to ownership transfers to billing—as shown in **Figure 4** below.

**Figure 4: Establishing a Property Value Chain<sup>14</sup>**

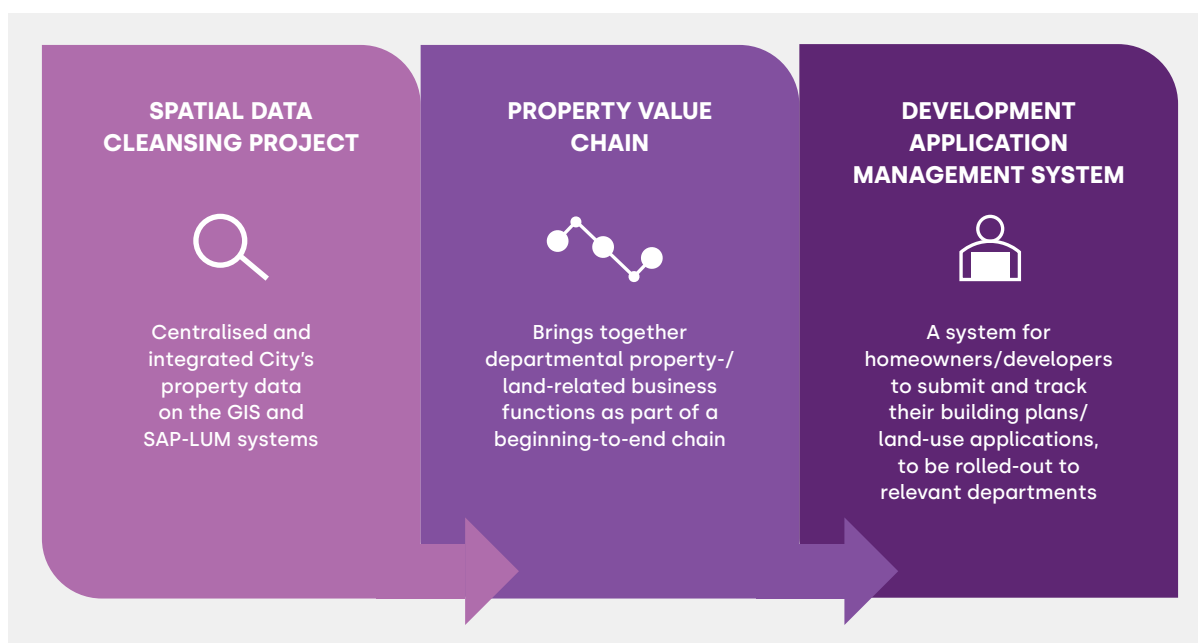


- 3. The Development Application Management System (DAMS)** was developed in tandem with the PVC from 2012. Further cleaning of the planning and building development management (PBDM) data and development of a Public Sector Records Management (PSRM) System on SAP took two years, before DAMS could be launched in 2014. DAMS provides a system for homeowners, property developers, architects, town planners, and land surveyors to submit their building plans and land-use applications electronically. It then automatically notifies line departments such as water and sanitation or solid waste to provide comment and clearance to applications via electronic workflows. DAMS was the first SAP-based platform of this kind built globally.

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<sup>14</sup> Adapted from City of Cape Town (2021), *Development Application Management System* [PowerPoint slides].

**Figure 5: Relationship between and development of the spatial data cleansing project, PVC and DAMS<sup>15</sup>**



One year after the introduction of DAMS, turnaround times for plans/ applications had also improved (see **Table 2** below) resulting in more efficient service delivery. Valuations and revenue clearance certificates were also expedited, improving cash flow in the City.

**Table 2: Improved turnaround times as a result of the DAMS system<sup>16</sup>**

|   | 2014    | 2015    |
|---|---------|---------|
| <b>Building plans</b>                         | 35 days | 5 days  |
| <b>Land-use applications</b>                  | 70 days | 30 days |
| <b>Valuations process</b>                     | 90 days | 20 days |
| <b>Issuing revenue clearance certificates</b> | 30 days | 10 days |

The PVC and DAMS have also been useful in other City departments, for example, in helping to monitor urban growth, plan asset investment and maintenance, and in feeding into Consumer Price Index calculations. Having DAMS in place during the Covid-19 pandemic meant that people could still submit and track the status of their plans and applications online during lockdown.

Despite these achievements, there are aspects of development management that continue to cause challenges with the public, that a

<sup>15</sup> Adapted from City of Cape Town (2021), *Development Application Management System* [PowerPoint slides].

<sup>16</sup> Adapted from City of Cape Town (2021), *Development Application Management System* [PowerPoint slides].

new IT system may not easily solve. For example, the types of building additions that have to go through formal approvals. This underscores the importance of getting the underlying process right, using technology simply as a tool to enact that process.

A revamping of the DAMS system is currently underway, to be completed by the end of 2023. DAMS-2 seeks to migrate all data to a more user-friendly SAP platform with a more interactive portal that supports mobile users as well. This migration necessitates another intensive data cleansing project to verify migrated data.

### Box 1: Implementing the City's ERP and IS&T system

#### SUCCESS FACTORS

- ✓ The City was in a state of great change at the time reforms were initiated, creating **a future-focussed innovation mindset** that assisted in driving forward the vision and strategy.
- ✓ The project was **led by business process reform**, with technology as an enabler of these processes, rather than technology-led.
- ✓ There was **strong leadership and political support** for the reforms that helped overcome any initial resistance, and transversal teams to drive implementation over an extended period.
- ✓ **Strong governance structures** were set up to manage risks and adapt when challenges were faced.
- ✓ **Data produced digitally was useful for other functions**, rather than just an output of the business process.

#### CHALLENGES

- ✗ The reforms were **all-consuming and resource-intensive** to implement, crowding out other work.
- ✗ The system was **not flexible** and took time to customise, creating delays in creating certain functions.
- ✗ The City was **'locked-in'** to one system, limited flexibility to take on new technologies as they emerged.
- ✗ The system was **not built for data integration** and sharing
- ✗ As time progressed, and technology moved on, the required SAP **skill-sets became scarce and costly.**
- ✗ **Assessing the socio-economic impact** of these technologies on residents and businesses.

## Connecting the wider city and e-Services

The wider Cape Town population needed to be connected to ICT services and more services should be available online and electronically.

The Smart City Strategy recognised that, alongside investing in the internal systems, technology needed to be seen as an economic enabler. This meant that (a) the wider Cape Town population needed to be connected to ICT services and (b) more services should be available online and electronically (i.e., e-services). These two focus areas were developed concurrently, throughout different phases of the City's development, and as technology progressed.

### Increasing public access to ICTs

To address increasing public access to ICTs, **the Smart Cape Access Project** started in 2002. It aimed to address the findings of a CCT Digital Divide Assessment undertaken the same year, which found that most communities had low ICT access and digital literacy, and highlighted the high degree of inequality in access across income groups<sup>17</sup>. The initial phase provided users in 6 lower-income neighbourhoods in Cape Town with computer access via City libraries. By 2003, there were 3000 registered Smart Cape users<sup>18</sup>. Following global recognition from the Gates Foundation's 'Access to Learning' Award, and associated funding of \$1 million, the project was extended to all 104 City libraries<sup>19</sup>.

A second initiative, **The Broadband Project**, starting in 2009, focused on connecting all City buildings (depots, cash offices, fire stations, community centres, clinics, and libraries) to the broadband network. Besides the City seeing this new technology as an economic enabler, the City was also motivated by preparing infrastructure and services for the 2010 FIFA World Cup. In addition to Wi-Fi routers, data packages, and software, this also involved the construction of a physical infrastructure layer (e.g., fibre optic underground cables) in areas where the national telecoms company, Telkom, had not yet extended its services.

The first phase (2009-2014) saw 82 City buildings connected. The second phase (2014-2018) expanded connection to 215 more City sites, and also saw public Wi-Fi access enabled on City sites<sup>20</sup>. Broadband now plays a crucial role in enabling other activities in the city, such as the communications and surveillance of law enforcement, and the connection of MyCiti bus stations and depots. However, over time, with the marked increase in private sector capabilities and the evolution of broadband technology, the logic of City involvement in this kind of infrastructure provision required review.

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17 Bridges.org and City of Cape Town (2002), *Taking Stock and Looking Ahead: Digital Divide Assessment of the City of Cape Town*.

18 City of Cape Town (2022), *Smart Cape* [Powerpoint slides].

19 City of Cape Town (2022), *Smart Cape* [Powerpoint slides].

20 City of Cape Town (2022), *Broadband Infrastructure Programme Corporate Services Portfolio Committee* [Powerpoint slides].

In recent years, rather than providing ICT access as a public good, the City's attention has shifted to focussing on its core mandate of improving service delivery through e-services as detailed below. Broadband now runs under a new long-term (10 year) operating model - the Broadband Improvement Project - which welcomes private sector assistance, and focusses increasingly on maintenance and upgrades. The Smart Cape Access project, now with over 500,000 registered users<sup>21</sup>, also continues to play a role in promoting digital literacy and IT skills.

In recent years, rather than providing ICT access as a public good, the City's attention has shifted to focussing on its core mandate of improving service delivery through e-services.

## Making services available online and electronically

In terms of connecting with citizens for service delivery, in 2000 the City began investing in and training its **City Call Centre** staff for service requests. **Service request** data was being recorded by 2003 to track progress, giving the City a much better idea on where services needed to be prioritised. There were some initial challenges with this system, particularly that there was no mechanism in place to track duplicate calls logged for the same service request from multiple callers.

The services system was made more accessible and more accurate over the years through continuous innovation:

- An **online e-services portal**, launched in 2011. Customers could log service requests online about water, sewage, electricity, waste drop-off points, street lights, general accounts etc., as well as enter meter readings and query municipal invoices. This new portal also helped overcome the issue of tracking duplicate records. A 22-day response rate to service requests was achieved at 97% in 2012, 99% in 2013, and 100% in 2014.<sup>22</sup>
- A new mobile service request application, **Mobi-site**, launched in 2014. Of the approximately 20,000 service requests logged online on the e-services portal in 2014, about 400 were logged through the mobi-site<sup>23</sup>.
- A **City App** is now under development to interact with the Cape Town residents and businesses on service queries, public participation, and access to information – addressing a range of e-service needs other than just service requests. The app will build on the existing app on load shedding (electricity outage) schedules and electricity service requests that was launched earlier in 2022.

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21 City of Cape Town (2022), *Smart Cape* [Powerpoint slides].

22 Adapted from City of Cape Town (2012), *Integrated Annual Report 2012/13* [https://resource.capetown.gov.za/documentcentre/Documents/City%20research%20reports%20and%20review/2012-2013\\_int\\_annual.pdf](https://resource.capetown.gov.za/documentcentre/Documents/City%20research%20reports%20and%20review/2012-2013_int_annual.pdf), and City of Cape Town (2012), *Integrated Development Plan 2016/17 Review* <https://resource.capetown.gov.za/documentcentre/Documents/City%20strategies%2C%20plans%20and%20frameworks/20162017%20Review%20and%20Amended.pdf>

23 Adapted from City of Cape Town (2014), *Integrated Annual Report* [https://resource.capetown.gov.za/documentcentre/Documents/City%20research%20reports%20and%20review/JOB009126\\_CoCT\\_IAR\\_v4\\_18Dec.pdf](https://resource.capetown.gov.za/documentcentre/Documents/City%20research%20reports%20and%20review/JOB009126_CoCT_IAR_v4_18Dec.pdf)

In the provision of e-services, the City needs to balance (1) the priorities and expectations of ratepayers, (2) the data and IT skills capacity of City staff, as well as (3) progressing towards equal access for all, to close the digital divide.

In the provision of e-services, the City needs to balance (1) the priorities and expectations of ratepayers, (2) the data and IT skills capacity of City staff, as well as (3) progressing towards equal access for all, to close the digital divide. The Call Centre is currently improving the user experience of the online service request process - simplifying the logging of requests and ensuring request accuracy. New introductions include a visual map of where services are already logged, and customer tracking of service request status - further improving on the earlier challenge of duplicate requests.

#### Box 2: Connecting the wider city and e-Services:

##### SUCCESS FACTORS

- ✓ Successful pilots resulted in **global recognition and additional funding** to extend projects.
- ✓ The City **planned for the long term and learnt as it went**, continually innovating and adapting projects to fit with current needs and priorities or when new technology became available.
- ✓ Careful **monitoring and consideration of the City's mandate** allowed it to change track when projects were better placed or delivered by external partners.

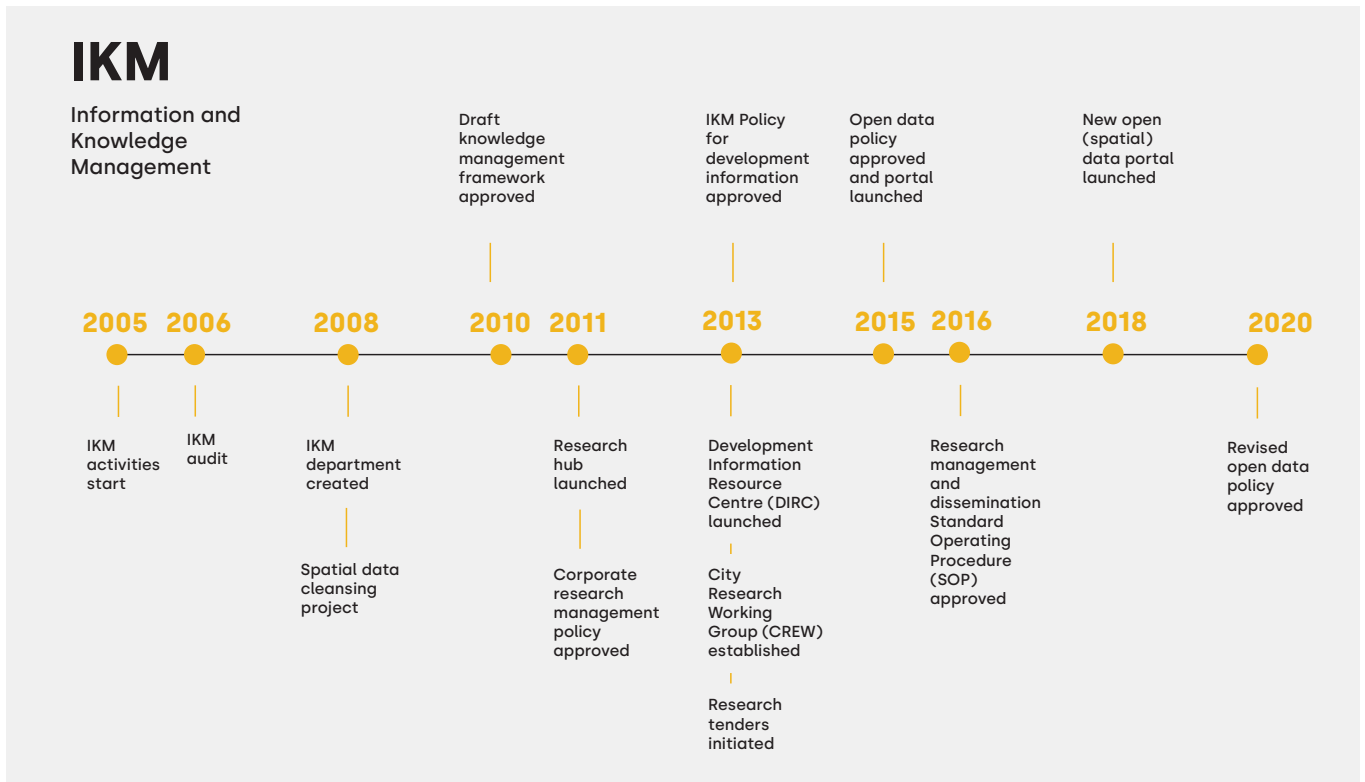
##### CHALLENGES

- ✗ **Budget constraints** affected ongoing operations and maintenance costs and sustaining large roll outs of ICTs.
- ✗ **Closing the digital divide** for City e-services to be accessible by all, and to ensure this does not drive further inequality.
- ✗ The City's need to keep up with the **rate payers' expectations** with regards to e-services, while considering the IT skills capacity in the City.



## 2. Information and Knowledge Management

Figure 6: Timeline of IKM reform in the City of Cape Town (2000-2022)



As the infrastructure for an IT-enabled administration was developed, and more information was becoming available in a digital format, embedding Information and Knowledge Management (IKM) practices became a focal point in 2005.

This was an effort to bring life to the 1998 Local Government White Paper, which encouraged municipalities to take stock of what they know, use this knowledge to inform further decision-making, and remain open to learning from other municipalities to continuously improve performance<sup>24</sup>. It also built on the Smart City Strategy objectives to better use and manage information. This was the beginning of the City's journey in actively thinking about corporate, coordinated use of data and research for strategic and operational needs.

### Managing the City's information internally

A **2006 IKM audit** determined that knowledge management in the City was limited due to a lack of centralised and coordinated information, as well as limited information about IKM activity in the City<sup>25</sup>. At the time, the City faced challenges of siloed sharing and limited integration of

<sup>24</sup> Provincial Government of the Western Cape and City of Cape Town (2004), *Working together - Learning together Collaborative Framework*.

<sup>25</sup> City of Cape Town Strategic Development Information & GIS Department (2010), *Draft Knowledge Management Framework*.

information between departments, lack of information or inaccessibility to information that exists, unsystematic capturing of knowledge, and the risk of duplicating initiatives across departments.

The City's IKM work was led by an **IKM department**, which was created in the corporate services division in 2008 after the local government elections and subsequent political and administration changes. The initial focus was on development information, and also leading on the data cleansing project and data centralisation on ESRI and SAP, as discussed in the use-case above.

**The IKM principles of 'leading and learning' - emphasising the need to collect, store, circulate, learn from, and mobilise the information and knowledge that the City has.**

At the same time a cross-departmental **Knowledge Management Task Team (KMTT)** was also formed to oversee the development of a **Knowledge Management Framework (KMF)**.<sup>26</sup> This was in part instigated by the focus on increasing the use of research, data, information, and knowledge in the preparation for South Africa's hosting of the 2010 FIFA World Cup. The draft KMF was approved in 2010, highlighting and promoting the IKM principles of 'leading and learning' - emphasising the need to collect, store, circulate, learn from, and mobilise the information and knowledge that the City has.

In 2011, the IKM department built on this momentum to develop the City's first policy targeting better research management: the **Corporate Research Management Policy Framework**<sup>27</sup> (ResMan Policy Framework). This aimed to facilitate:

- **Enhanced conceptualisation and framing of research to match City needs** i.e. to answer a research question or investigate a challenge.
- **The practical application of research** and its results, with well thought out recommendations and guidelines within the stages of research.
- **A broad procedure for conducting research.**
- **A centralised knowledge hub** for the submission of reports and other information about completed research - the Research Hub.

The **City Research Working Group (CREW)** was set up in 2013 to oversee complex research projects, facilitate cross-departmental research, and to input into future research priorities.

Also in 2013, as the PVC and DAMS were being put in place following the spatial data cleansing project, the IKM department developed the **Development Information Resource Centre (DIRC)** – an integrated intranet platform and inventory containing all of the organisation's development-related information and knowledge management assets to complement the new system.

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<sup>26</sup> City of Cape Town Strategic Development Information & GIS Department (2010), *Draft Knowledge Management Framework*.

<sup>27</sup> City of Cape Town Strategic Development Information & GIS Department (2011), *Corporate Research Management Policy Framework and Guidelines*.

The **research hub** was brought under DIRC as a sub-site, and DIRC is now the single access point for the City's development-related data, information or knowledge, as well as the corporate research repository. This was important in creating 'one version of the truth', or 'official statistics' for City officials to draw from. As of 2016, DIRC has been receiving approximately 8,600 unique visits per month, reflecting the activity of about 730 unique visitors per month.<sup>28</sup>

The **IKM Policy**<sup>29</sup>, approved in 2013, was developed alongside DIRC and provided guidelines and grounds for implementation and engagement of IKM principles, with departments identifying priority areas for KM intervention. While the initial intention was to develop a broad framework governing all types of data and information, the IKM Policy ended up with a strong focus on development information. This was linked to an identified gap at the time, but also due to then-emerging complications resulting from the lack of data integration and standardisation across departments. It became very difficult to create a unified policy when information was housed in different systems, each with different governing mechanisms. The goal then evolved to use what has been built for development information to showcase KM possibilities for other departments.

Despite this progress, IKM maturity remains uneven across City departments, with some departments only just beginning to make use of internal SharePoint sites. While all directors have knowledge management outlined in their job descriptions, and **Data Stewards** have been identified in the organisation, this is only a small part of their role, and often not prioritised amongst many other urgent demands on their time. Data stewards are responsible for maintaining the quality of the data<sup>30</sup> and managing the data through, for example, metadata descriptions or assigning access rights<sup>31</sup>.

## Open data

As core information management frameworks and policies had been developed, and internal data and research cleaning and centralisation was making progress, the City began to embark on the next phase of the journey: making the City's data more accessible externally.

Discussions around open data particularly began to emerge when CCT was declared the World Design Capital (WDC) in 2014, as Helsinki - the previous WDC - had also implemented an open data portal. An **Open Data Policy** was approved in 2015, outlining the legal provisions, policy parameters, stakeholder involvement, and regulatory context for a

**A public use Open Data Portal. The goal was to make certain datasets available to all, free of charge, in a usable and easily accessible format.**

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28 Adapted from City of Cape Town (2016), *DIRC Usage Report* [PowerPoint].

29 City of Cape Town Strategic Development Information & GIS Department (2013), *Information and Knowledge Management (IKM) Policy Pertaining to Development Information*.

30 City of Cape Town (n.d.), *Data Governance Roles* [PowerPoint].

31 City of Cape Town Information and Knowledge Management Department (2020), *Standard Operating Procedure for Data Access Classification*.

public use Open Data Portal. The goal was to make certain datasets available to all, free of charge, in a usable and easily accessible format.

An **Open Data Steering Committee** was set up to oversee the implementation, and included both cross-departmental and external stakeholders. The steering committee led in advocating for the shift to openness, and in advising when data sets should remain protected. The IKM department also conducted research on the design of open data portals in other cities, learning from cities like Helsinki, Melbourne and Sydney. The custom design of the portal began shortly after, taking only five months to be developed. This was strongly enabled by the existing IKM and IS&T infrastructure and skills base in the City.

As with many new initiatives, the Portal was met with some internal concerns at the onset. Departments were reluctant to make their data public for a number of reasons:

- They viewed their data as their own, and did not want to relinquish control of it.
- They were concerned that their data was of low quality.
- They feared that certain data would reflect poorly on the City's reputation.
- They feared that the release of certain data might expose the City to a security or business risk.

It was important to convince departments of the value of open data by demonstrating how open data had improved similar business activities in other organisations. This, together with the then Mayor's strong support, enabled the team to bring other departments on board and for the portal to be launched.

**Data sets that are frequently requested, easily available, not private, and required by law to be made public are now published on the portal.**

Data sets that are frequently requested, easily available, not private, and required by law to be made public are now published on the portal - including City budget data, location boundaries of some public land, MyCiti bus station routes, awarded tenders, service-level agreements, statistical reports, property valuations data, and address data.

The portal is managed and maintained by the IKM department, and as stipulated in the IKM policy and reiterated in the Open Data Policy. **Data Custodians** in each department, whose broader role involves managing the technical environment in which data is stored<sup>32</sup> and access to City data, are responsible for collating, publishing and updating the data on the open data portal.<sup>33</sup>

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<sup>32</sup> City of Cape Town Information and Knowledge Management Department (2020), *Standard Operating Procedure for Data Access Classification*.

<sup>33</sup> City of Cape Town (2020), *Open Data Policy*.

An ongoing challenge is increasing public uptake and following up on outputs and value generated by using the portal, given there was limited budget for outreach and marketing. The portal sees an average of 1,500-2,000 downloads per month, which has remained consistent since 2017<sup>34</sup>. Users are mostly students and researchers, followed by a few corporates, with very few users sending their analyses or results back to the City.

A new ESRI version of the portal has been available since 2018, responding to a need for the portal to support spatial data, data visualisation, and the automated publication of real-time data. The majority of the data was migrated to the new portal early on; non-spatial data has taken longer, as technical and formatting issues need to be resolved, so the two portals are currently operating concurrently.

In some cases, data governance issues also needed to be addressed prior to the migration, for example, moving the management of certain GIS datasets to the centralised IT systems unit so that they could be better maintained and enable 'live' data to be disseminated. The new portal also has auto-updates, meaning that data is pulled from servers without human intervention.

## Engaging with external researchers

Alongside open data, the City also started to think about research with a more holistic lens. In 2016, the **Research Management and Dissemination (RM&D) SOP**<sup>35</sup> was created to replace the Research Management Policy Framework, expanding from understanding what research was needed or being done in the City, to include the external research being done on or with the city as well.

There was a particular focus on research reviews and a process for quality control before releasing research and data publicly, guarding particularly against low-quality research, and ensuring the use of appropriate City branding and disclaimers to help differentiate between research findings and the City's official view. The City's first transversal **research tenders** were also initiated in 2013 and put in place in 2016, to streamline the contracting of external service providers and improve turn-around times and research quality.

...expanding from understanding what research was needed or being done in the City, to include the external research being done on or with the city as well.

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34 City of Cape Town (2017), *Integrated Annual Report* [https://resource.capetown.gov.za/documentcentre/Documents/City%20research%20reports%20and%20review/CCT%20Integrated%20Annual%20Report%202017\\_18.pdf](https://resource.capetown.gov.za/documentcentre/Documents/City%20research%20reports%20and%20review/CCT%20Integrated%20Annual%20Report%202017_18.pdf); City of Cape Town (2018), *Integrated Annual Report* [https://resource.capetown.gov.za/documentcentre/Documents/City%20research%20reports%20and%20review/CCT\\_Annual\\_Report\\_2018\\_19.pdf](https://resource.capetown.gov.za/documentcentre/Documents/City%20research%20reports%20and%20review/CCT_Annual_Report_2018_19.pdf); City of Cape Town (2019), *Integrated Annual Report* [https://resource.capetown.gov.za/documentcentre/Documents/City%20research%20reports%20and%20review/2019\\_20\\_Integrated\\_Annual\\_Report.pdf](https://resource.capetown.gov.za/documentcentre/Documents/City%20research%20reports%20and%20review/2019_20_Integrated_Annual_Report.pdf)

35 City of Cape Town (2017), *Research Management and Dissemination Standard Operating Procedure (SOP)*.

### Box 3: Information and Knowledge Management:

#### SUCCESS FACTORS

- ✓ **Strong leadership and political backing** for several IKM initiatives.
- ✓ **Pro-active and targeted sensitisation** and departmental engagement to entrench IKM principles within the organisation.
- ✓ Focusing on one, easier area first to **showcase possibilities and results**.
- ✓ **Strong IS&T skills base and infrastructure** in the City, which enabled further work.
- ✓ **Legal provisions** for sharing certain datasets publicly already in place.
- ✓ **Learning from other cities** to fast-track progress and avoid challenges.

#### CHALLENGES

- ✗ Knowledge management is **not seen as an immediate priority** when faced with resource-constraints, making it difficult to sustain commitment and cooperation.
- ✗ **Uneven maturity** in IKM across the organisation, struggle to maintain compliance with processes across departments.
- ✗ Data integration was not designed into infrastructure and systems from the start, and **lack of standardisation** of data management and governance.
- ✗ **Fear or resistance to data sharing**.
- ✗ Limited budget to promote uptake of public systems, and **inability to understand and track value created** through opening data.

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### 3. Positioning data and research for decision making

Over the years, the automation of CCT systems and improved knowledge management have resulted in the generation and consolidation of large amounts of data and research information and reports. While the focus was initially more on systems and operations, the City matured into viewing this data and research as assets in their own right - generating value and contributing to evidence-based decision making.

However, the City still struggled with siloed management and use of data, and continued to lack some of the required information to make informed decisions. Furthermore, while research functions were in place, research was not always targeted at the City's core objectives, and research partnerships were limited.

The City's **Organisational Development Transformation Plan (ODTP)**<sup>36</sup> of 2017, and a new Integrated Development Plan (IDP)<sup>37</sup> cycle (2017-2022), provided the catalyst for change. The ODTP was motivated by a recognition that, with rapid urbanisation, the organisation is operating in an increasingly dynamic environment. This would require more transversal policies and faster decisions to be made. It would also require a shift in the culture of service delivery from enforcing compliance to putting the customer at the centre of responses. Going forward, policy was to be explicitly linked to some form of evidence or data, and the evaluation of policy effectiveness was to have measurable criteria. A culture of evidenced-based decision-making (EBDM) was forming.

These developments led to the creation of the **Policy and Strategy department** to oversee the development of transversal policies, in which the research unit was relocated from IKM. The **Organisational Performance Management department** was also created and brought in data science expertise. It was tasked with developing Monitoring and Evaluation (M&E) frameworks for policies, tracking organisational performance and developing management reports, and guiding departments on how to evaluate outcomes on their own projects.

While many were in support of these changes, some were concerned that this could expose areas of oversight or inefficiency in departments. Others also thought that the investment in evidence would be wasted: that decision makers would continue to make decisions based on experience, political pressures, or gut feeling, regardless of what the evidence said. All noted that for evidence to have impact, it needed to be actionable and implementable to relevant decision-makers – and so the type of evidence matters for whether it is useful or not, and to know where and how the evidence will be used.

While the focus was initially more on systems and operations, the City matured into viewing this data and research as assets in their own right - generating value and contributing to evidence-based decision making.

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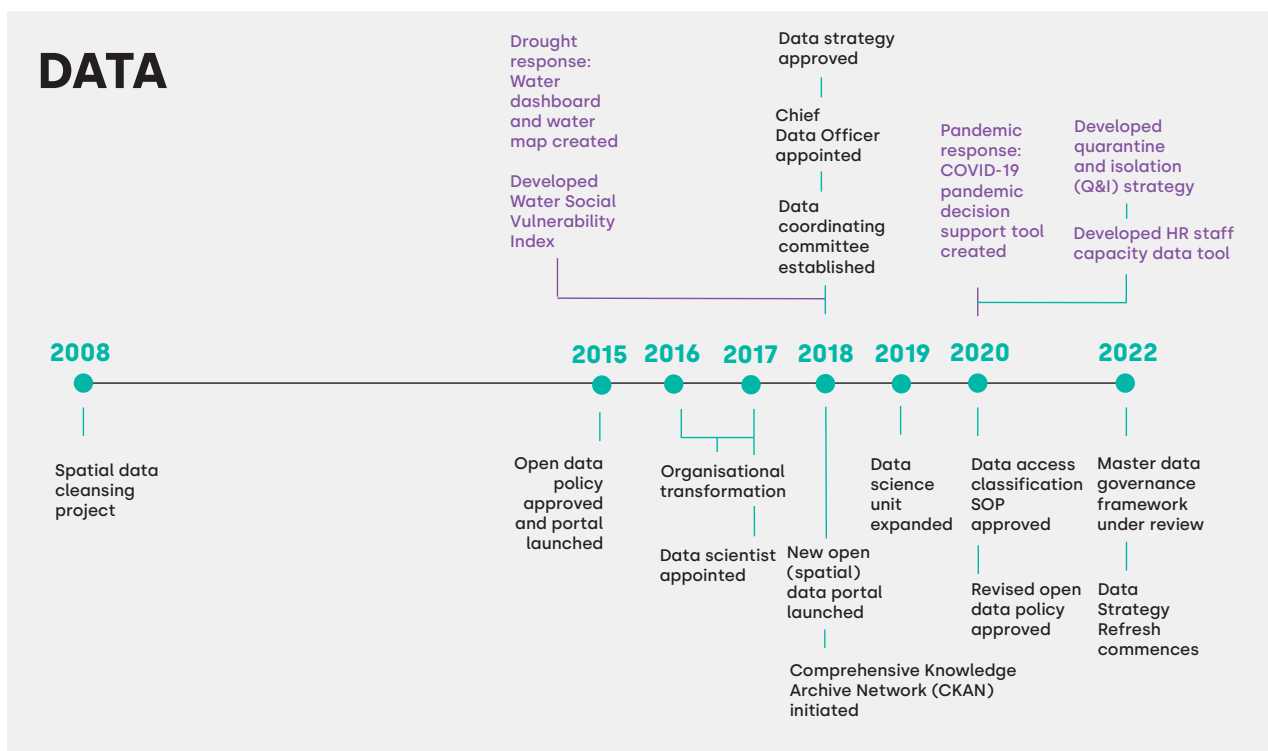
36 City of Cape Town (2017), *Organisational Development and Transformation Plan (ODTP)* [https://resource.capetown.gov.za/documentcentre/Documents/City%20strategies,%20plans%20and%20frameworks/Organisational%20Development%20and%20Transformation%20Plan%20\(ODTP\).pdf](https://resource.capetown.gov.za/documentcentre/Documents/City%20strategies,%20plans%20and%20frameworks/Organisational%20Development%20and%20Transformation%20Plan%20(ODTP).pdf)

37 City of Cape Town (2017), *Five-year Integrated Development Plan July 2017-June 2022*. <https://resource.capetown.gov.za/documentcentre/Documents/City%20strategies%2c%20plans%20and%20frameworks/IDP%202017-2022.pdf>

While the ODTP brought about the explicit focus in the City's positioning data and research for strategic and operational decision-making, it built heavily on the momentum, systems, and governance structures of the earlier initiatives in the IKM department discussed above. The maturation in the City's data and research practices described below must also, in part, be attributed to the heightened needs, required responses, and opportunities during times of crisis - including the Cape Town water crisis/drought (2017/18) and then the global Covid-19 pandemic (2019/20). These are discussed in detail in a use-case at the end of the section.

## Data for decision making

**Figure 6: Timeline of data reform in the City of Cape Town (2000-2022)**



While certain line departments, such as Spatial Planning and Transport, had been using data for day-to-day activities such as asset maintenance and scenario modelling for quite some time (see Box 2), there was no strategic view or approach to deriving value from data across the organisation. The move towards open data, coupled with EBDM thinking taking shape among City practices during the ODTP, highlighted the need for a City strategy that guided the use of data more strategically. This would also require organisational change, and new sets of specialised skills.



#### Box 4: Examples of City Data types and sources

**Administrative data** is derived as a by-product of existing processes and systems. This is mostly generated through SAP, e.g., financial, supply chain management and HR data.

**Spatial data:** The second largest data source is the spatial data derived through the ESRI GIS software - where the map layers are provided by ESRI, or created by departments, and the spatial data is self-generated by City staff in the field.

Spatial, quantitative, and qualitative data is routinely collected by line departments and fed into SAP and ESRI for M&E and reporting, for example, data on asset maintenance, drinking water quality, or customer satisfaction.

**Survey data:** This largely comes from Statistics South Africa or other spheres of government, but, apart from the census, the data is often not at granular-enough scales to be useful at the city level. When the City needs to procure data from an external source, this is done through contracts or tenders.

In some cases, the City is able to obtain survey data from research institutes, or administrative data e.g., mobile phone data from private sector companies.

**The City's Data Strategy**<sup>38</sup> was drafted and approved in 2018. Having built on over a decade of data readiness work using IKM and IS&T, the strategy gives direction and grounds for embedding data into City practices, attempting to push the organisation beyond reporting and towards critically engaging with data for prediction or impact evaluation. It asserts that the City should:

1. Be an organisation that recognises the **value** of data for strategic and operational decision making.
2. Facilitate an environment where data is treated as a **shared** public good, to be used collaboratively to meet the ever-evolving needs of its customers.
3. Harness external expertise and support in data **partnerships** to enhance its technical data capabilities cost-effectively.
4. Drive data-driven decision making by enhancing data generation, management and analytical **capabilities** of staff.
5. Develop a sustainable, enabling, and forward-looking data **architecture** that supports the growing need for new data-sharing and analytical environments.
6. Improves data **governance** to ensure one source of truth, while accounting for data quality, integrity, and security.

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<sup>38</sup> City of Cape Town (2018), *Data Strategy*.

**The Data Strategy implementation** plan then turned these 6 principles into workstreams.<sup>39</sup> In addition to building foundations and setting guidelines in each area, case studies were used in order to build a more intuitive and in-depth understanding of EBDM and the use and application of data for the organisation.

**The Data Coordinating Committee (DCC)**, a governance committee responsible for overseeing the implementation of the data strategy, was established. The Executive Director of Corporate Services was appointed as the City's first **Chief Data Officer (CDO)** to chair the committee. A further 6 members were appointed, each responsible for delivering on one of the workstreams. For example, the workstream lead for data governance is the IKM director, given the natural link between these two roles. This structure also replaced the Open Data Steering Committee under IKM. These work streams are supported by a range of teams across the organisation.

**While the Data Strategy was enhanced by the strong skills base of the Data Science team and the support of the CDO, it also built on the foundational Open Data work.**

A new **Data Science unit** was also established in 2019, expanding from the single data scientist appointed in 2016/17 as part of the new Organisational Performance Management (OPM) department. The intention was to develop the analytical and systems capacity to use data to respond to organisational and performance needs.

The unit was tasked as the overall secretariat of the Data Strategy implementation plan, but also specifically focussing on the architecture workstream. The Data Science unit's general day-to-day work also involves technical and data-use support to various departments for reports, auditing, statistical analysis, and visualisation, including building the capacity to use data to inform decisions, predictions, and impact evaluations.

While the Data Strategy was enhanced by the strong skills base of the Data Science team and the support of the CDO, it also built on the foundational work completed during the creation of the Open Data Policy and portal. The role, value, and reliability of data was already appreciated, and data stewards in each department were already in place.

## Implementing the Data Strategy

The Data Strategy identified the key challenges to realise the value of data as a shared asset, and assessed how far the organisation had come in terms of their overall data maturity. Some of the main findings were on:

- **Data sharing and collaboration** – data is collected and processed in silos, and deep institutional knowledge was needed to know – in the absence of standardised processes or metadata descriptions - what

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<sup>39</sup> City of Cape Town (2018), *Report to City Manager: Status Update - City of Cape Town Data Strategy* [https://www.capetown.gov.za/councilonline/\\_layouts/OpenDocument/OpenDocument.aspx?DocumentId=42cfdac5-a6e3-498d-942c-cb3d80ccf80d](https://www.capetown.gov.za/councilonline/_layouts/OpenDocument/OpenDocument.aspx?DocumentId=42cfdac5-a6e3-498d-942c-cb3d80ccf80d)

data is available and where to find it. Departments were also still protective of certain data.

- **Data architecture** – One of the major challenges faced as a result of SAP was that systems were not built in a way that integrated data from the start. This has made both data extraction and data sharing difficult.
- **Data governance** – there were numerous challenges in this workstream, including:
  - **Data quality** – there are often different statistics on the same data points, or 'multiple versions of the truth', posing a risk to decision-making.
  - **Data custodianship** – uncertain accountability and ownership over data between different departments, units, and individuals, which has slowed down the pace of implementation and sharing.
  - **Data security** – no consistent approach to balancing trade-offs between sharing and security.
- **Data capabilities** – data maturity is uneven across the organisation. Good and bad data are often used together, affecting reliability. There is also a need for more training in analytics and change management.

Progress has been achieved to varying extents on each of these over the past few years.

On **data architecture**, the data science unit, working closely with the DCC, CDO, the IKM department, the Policy and Strategy department, as well as external research partners, developed the use of a new platform to enable sharing while being cognisant of privacy and security: the **Comprehensive Knowledge Archive Network (CKAN)**.

CKAN is an open-source data-sharing portal that can be used to share private data with both internal and external stakeholders, with an ability to set different levels of data access to different users. The City's ongoing **CAR** process is also taking seriously the need for forward-looking and open-source systems to ensure the data architecture is more flexible, integrated and amenable to data extraction and sharing across the organisation.

The City's ongoing **CAR** process is also taking seriously the need for forward-looking and open-source systems.

**Data accessibility and security** has been advanced by the 2020 **Data Access Classification** Standard Operating Procedure (SOP)<sup>40</sup>, which set classification and protection standards for City data to ensure appropriate accessibility, storage, anonymisation, and risk management (see **Table 3**). This is in alignment with the National Protection of Access to Information Act (PAIA) of 2001<sup>41</sup> and Protection of Personal

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40 City of Cape Town Information and Knowledge Management Department (2020), *Standard Operating Procedure for Data Access Classification*.

41 Promotion of Access to Information Act, 2. (2000) [https://www.gov.za/sites/default/files/gcis\\_document/201409/a2-000.pdf](https://www.gov.za/sites/default/files/gcis_document/201409/a2-000.pdf)

Information Act (POPIA) of 2021.<sup>42,43</sup> The SOP states that all data should be open by default, and data custodians then need to justify keeping data 'closed' under levels 2-4, described below.

**Table 3: City Data Access Classification Levels (City of Cape Town Data Access Classification Standard Operating Procedure, 2020)**

|  |  |  |   |
|--|--|--|---|
| <p><b>LEVEL 1: OPEN</b><br/>E.g., website, tenders, budgets, property sales, City facility locations</p> | <p><b>LEVEL 2: INTERNAL</b><br/>E.g., systems &amp; network diagrams, operational stats, certain research data</p> | <p><b>LEVEL 3: RESTRICTED</b><br/>E.g., personal information of staff and residents, account information</p> | <p><b>LEVEL 4: CONFIDENTIAL</b><br/>E.g., any data that, if released, could threaten life/damage operations</p> |
|--|--|--|---|

A **revised Open Data Policy** was also approved in 2020 which increases emphasis on the need for the City to be transparent and make data open and available to the public where appropriate. Special attention is paid to the constitutional right in Section 32(1)(a) of the Constitution, for everyone to have access to any information held by the state.

On **data governance and custodianship, A Data Governance Framework** is currently (2022) under review for approval, which proposes custodian engagement through a central committee. The IKM Department is also developing a City-wide **taxonomy for City data**, which will support in identifying and standardising datasets for sharing, as well as Enterprise Content Management work i.e., developing dynamic combinations of strategies, methods and tools to better capture, manage, store, and deliver information to support key organisational processes<sup>44</sup>.

Overall, one can see that the value of data has been entrenched almost organisation-wide, indicating an encouraging data culture shift.

On **data capabilities**, the City's data capabilities are being supported through the preparation of data competency frameworks, data training and literacy approaches, data ethics, as well as the development of internal data case studies and use cases to better understand City data use and application. The data science team's day-to-day work with departments, and other City departments' data related work, are demonstrating gradual maturity in staff's technical and analytical capacity to work with and use data. Overall, one can see that the value of data has been entrenched almost organisation-wide, indicating an encouraging data culture shift, however there is still a gap in departments critically engaging with data for prediction and measuring impact.

An ongoing challenge that goes beyond the data strategy are the gaps in data that limit the City's ability to make meaningful data-based decisions. Most prominently this includes a lack of comprehensive and integrated data on the City's informal sector and informal settlements

42 Protection of Personal Information Act, 4. (2013) [https://www.gov.za/sites/default/files/gcis\\_document/201409/3706726-11act4of2013protectionofpersonalinforcorrect.pdf](https://www.gov.za/sites/default/files/gcis_document/201409/3706726-11act4of2013protectionofpersonalinforcorrect.pdf)

43 Where PAIA promotes the constitutional right to access information from a public and private body, POPIA promotes the constitutional right to have personal information protected by the public and private bodies processing such information.

44 Association for Intelligent Information Management (n.d.) *What is Enterprise Content Management Work?* <https://www.aiim.org/resources/glossary/enterprise-content-management>

– largely a result of the emphasis on data from SAP, which only captures the data of those who formally transact with the City. The exclusion of information on informal parts of the city results in an incomplete and dis-integrated view of the city and city needs, reducing the reliability of any analysis or decisions made without it.

In many cases, 'innovative' sources have been used to fill this gap, such as aerial imagery to identify and count settlement and structure roofs; however, there are still a number of limitations and considerations that need to be taken into account. An **Informal Settlement Data Programme** with an interdepartmental task team has recently been initiated to address this gap. It aims to develop a long-term, integrated, and dynamic informal settlement dataset, with documented procedures that are visible to all City departments.

Incorporating the lessons learnt, a **data strategy refresh** has started to assess overall progress and set new objectives as the organisation develops and matures, and to ensure alignment with the changing needs of the organisation. The refresh will focus on deepening the City's data capabilities and building a culture of using data in predictions and impact measurement, departing from a "report and forget" culture and moving towards a culture to "investigate, analyse, and act".

#### Box 5: Data for decision making

##### SUCCESS FACTORS

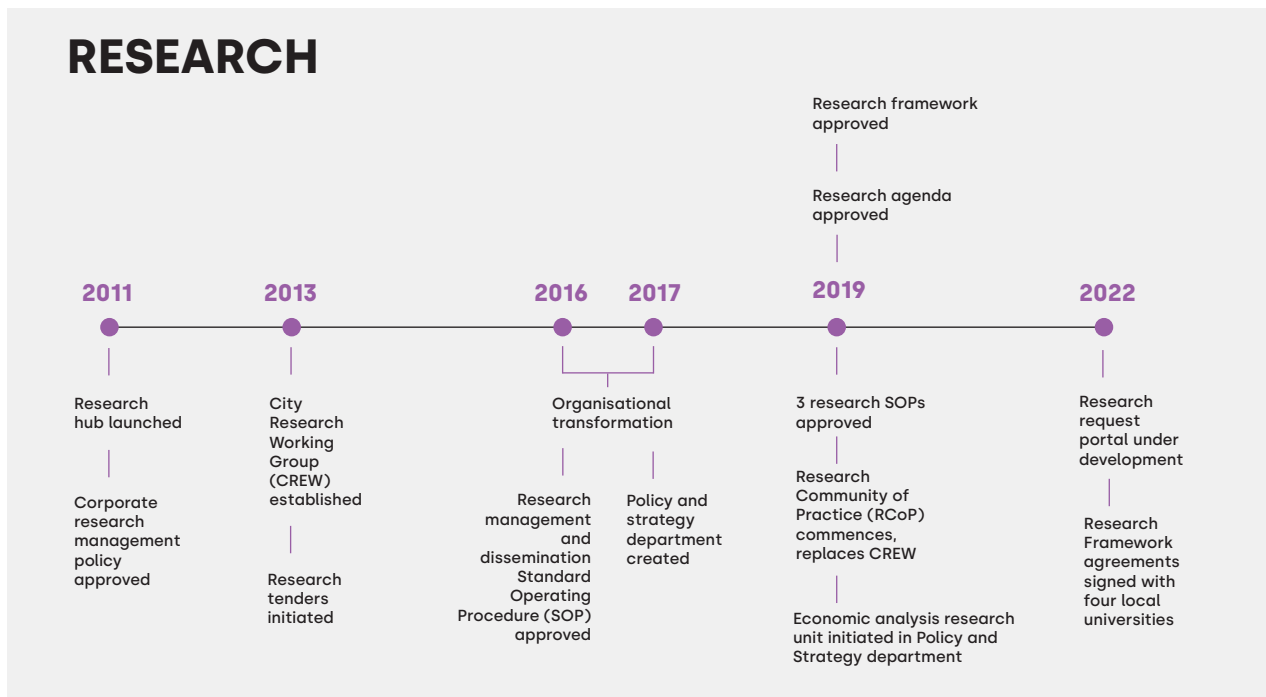
- ✓ The data strategy **set the strategic vision** and gave direction, embedding and enabling the value of data organisation-wide.
- ✓ **Combining foundational work with practical case studies** to build understanding and appreciation across the organisation as a whole.
- ✓ **Investment in strong in-house capabilities** in data science, and data **leadership** in the Chief Data Officer.
- ✓ Ability to **build on decades of data readiness work**, infrastructure and skills of the IKM, IS&T and research teams, as well as other City line departments and support teams.

##### CHALLENGES

- ✗ **Lack of integrated data systems and processes** across departments.
- ✗ Data **capabilities and governance maturity is uneven** among departments.
- ✗ **Moving beyond reporting to critically engaging** with data for prediction/ measuring impact.
- ✗ **Data gaps** on informality and others, such as economic data on firms.

## Using research to inform City decisions

**Figure 7: Timeline of research reform in the City of Cape Town (2000-2022)**



Across City departments, research is periodically undertaken for planning and operational purposes, including surveys on infrastructure quality and studies on infrastructure usage, and to update service plans. Research may be conducted (or contracted out) in the City to:

- Understand the broader context within which an urban issue is located
- Inform options for City actions
- Understand the feasibility of projects
- Model urban developments
- Understand potential implications for the City in light of an urban issue or project
- Monitor and evaluate project outcomes

Part of the corporate research team's mandate is to facilitate this research and maintain a core understanding of what is happening in the City and wider Cape Town - including data on the population and their socio-economic status at a sub-city scale. The City's capabilities in this regard were built early on, given that census data from the national statistics agency is only available every 10 years, and more frequent surveys are not representative at a disaggregated scale. The City filled the gaps by ensuring that they used their administrative data well, and also invested in additional surveys, aligning with the national statistics agency where needed.

While some research is conducted in-house, the City contracts much of this work out to private firms through research and programme tenders. The City also partners with universities and research institutes to achieve some of its research needs. For example, strong relationships have developed with local universities through the Cape Higher Education Consortium (CHEC). The CHEC Collaborative partnership began in 2008, with over 30 research projects completed in 4 phases from 2015 onwards<sup>45</sup>.

The City also has research agreements with its four local universities and research institutes within the universities, for example the African Centre for Cities and J-PAL Africa at the University of Cape Town, and the International Growth Centre at the London School of Economics and Political Science.

Apart from research for the City's own purposes, the City also plays an important role in facilitating research as a public good. By making its data, staff, and other resources available to external researchers, it supports the broader research community and knowledge generation on Cape Town and CCT.

The Corporate Research Unit works across departments to align research with strategic objectives and to create standardised policies and processes for managing the research conducted. The unit also researches and monitors strategic information and provides interpretation and insights. While previously this fell under the IKM department, in 2017 the unit moved to the new Policy and Strategy Department. The associated focus on transversal policy processes and evidence-based decision making called for a shift in research governance - building on the 2016 RM&D SOP, and aligning with the Data Strategy, the City's focus on evidence-based decision-making, and the IDP 2017-2022.

The **Research Framework**<sup>46</sup> was approved in 2019, and sets the City's research vision to be "an organisation that actively pursues quality research to build the knowledge and evidence necessary for responsive service delivery and effective city governance." It has three associated SOPs:

- The **Research management SOP**<sup>47</sup> (update of the 2016 RM&D SOP) includes a protocol for the dissemination of reports in the City, and into the public domain, and the review of external research reports for recommendations to the City.
- The **Request for permission to conduct research in the City SOP**<sup>48</sup> (update of the 2015 and 2017 versions of the guideline) gives the approach, process, and requirements for approval of research requests received by CCT.

**Apart from research for the City's own purposes, the City also plays a role in facilitating research as a public good by making its data, staff, and other resources available to external researchers.**

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45 Sourced from interviews with City of Cape Town officials (2022).

46 City of Cape Town (2019), *Research Framework*.

47 City of Cape Town (2019), *Research Framework*.

48 City of Cape Town (2017), *Guidelines and Process: Request for permission to conduct research in the City Standard Operating Procedure*.

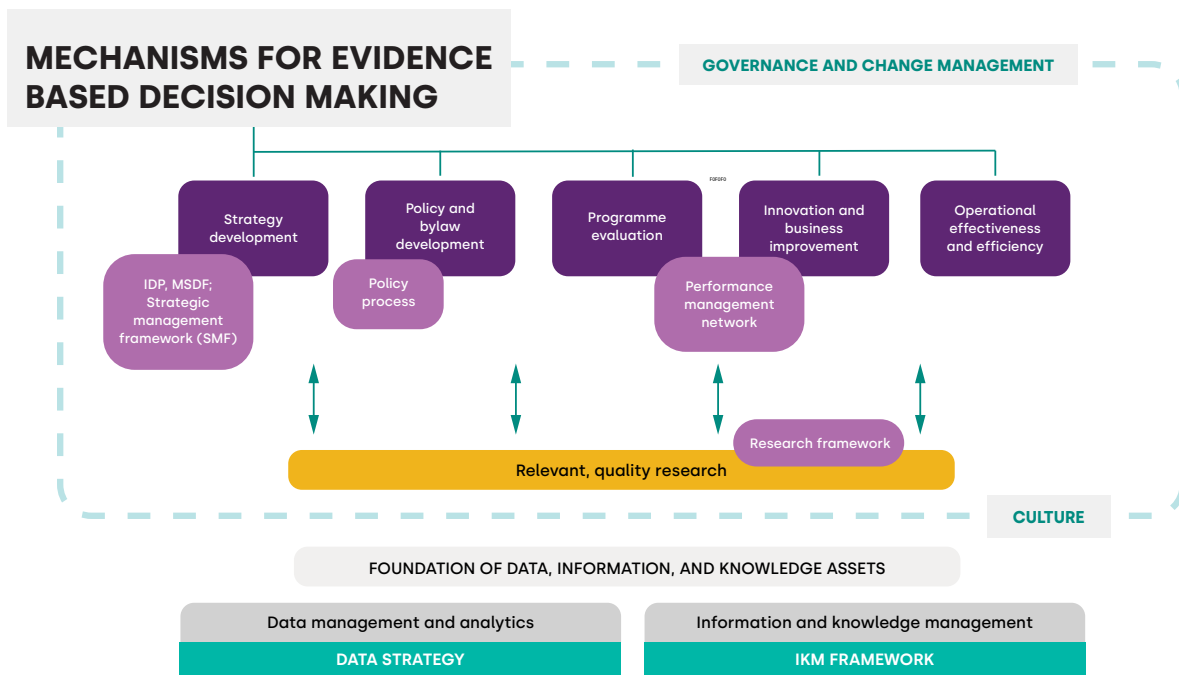
- The **Research partnership SOP**<sup>49</sup> which guides the establishment and management of research partnerships. It outlines how, with whom, and around which key issues the City partners on research.

An acknowledgement that research forms a core foundation of the evidence base for decision making was enshrined in the research framework.

These 3 SOPs are embedded under their relevant enablers in the Research Framework as specific activities that need to be followed during the research process. A **research framework implementation plan** was also developed, recognising the different roles in the research processes at a corporate, strategic and line level. This includes quarterly reporting so that progress can be monitored.

An acknowledgement that research forms a core foundation of the evidence base for decision making was enshrined in the research framework. As shown by **Figure 8** below, research draws on data and management analytics (guided by the Data Strategy) as well as information and knowledge management (guided by the IKM policy) to enable strategy and policy development, programme evaluation, business improvement, and operational effectiveness and efficiency. Taken together and within City’s governance and culture context, this leads to more effective City decisions.

**Figure 8: Mechanisms for Evidence Based Decision Making**<sup>50</sup>



An internal, 'living' **City Research Agenda** was also established, which outlines the City’s priority research themes, and aims to better target research activities both internally and with external researchers. It is updated intermittently, following engagements which highlight unforeseen research priorities, or when Mayoral or IDP commitments

49 City of Cape Town (2019), *Research Framework*.

50 City of Cape Town (2019), *Research Framework*.



evolve. The corporate research unit helps in consulting with departments and external stakeholders to align research with priority objectives. There are plans for the agenda to be expanded with a focus on the City's new IDP (2022-2027), and shared with key external stakeholders in the future.

The **Research Hub**, developed under the IKM branch, is still in use as the City's platform for accessing and managing research assets. This includes approved research requests from external researchers, completed reports on CCT-commissioned research, the CCT research framework and SOPs, and research partnership information. City research is expected to follow a standard process within each stage of the Research Value Chain, as seen below in **Figure 9**.

City research is expected to follow a standard process within each stage of the Research Value Chain.

**Figure 9: The City of Cape Town's Research Value Chain<sup>51</sup>**



In 2019, CREW was reconvened as a **Research Community of Practice (RCoP)**, chaired by the Corporate Research Unit. The RCoP came at a time when there was broader and increasing acceptance of the value and importance of research. The RCoP, led by the Head of Organisational Research in the Policy and Strategy department, was designed to access inputs to inform the Research Framework implementation, and more broadly to build research maturity across the organisation.

It was also built to overcome departments working in silos and facilitate transversal research projects, targeting complex challenges that affect the City as a whole. In 2022, the RCoP has matured to include a Core Group of City research practitioners, who will further support and guide the strategic aspects of the City's research framework implementation and the City's IDP Research agenda.

<sup>51</sup> City of Cape Town (2019), *Research Framework*.

**It remains an ongoing need to embed an organisation-wide understanding of research and a culture of evidence-based decision making.**

In 2020 and 2022, the RCoP conducted a **research skills survey and follow up survey**, asking members to self-assess their research skills, so as to identify their training needs and what skills they can share with other City officials. Given the differing levels of maturity across departments, it remains an ongoing need to embed an organisation-wide understanding of research and a culture of evidence-based decision making, including building the skills necessary to critically engage with research findings, and their implication for City decisions. Without this level of maturity across the City departments, it is difficult to build compliance with the necessary research administration procedures, and to enhance the overall quality of research, and its use to inform decisions.

In addition to research management, there have also been challenges experienced in **commissioning research** to be done for the City. In particular, to better respond to the City's need to conduct research that is actionable and implementable, procedures for contracting service providers and research partners were refined. The two 3-year tenders put in place in 2016 were thus replaced with 5-year tenders in 2021/22, to facilitate longer term research projects and account for long lead times in appointing services providers. Research agreements between the City and universities as well as other research partners are now also aiming to be for at least a 3-year period, with an in-built review and renewal option, so that research can be easily extended if all parties agree, helping with continuity.

Furthermore, while in some cases it makes sense to contract research externally or leverage research partnerships, in others it is more efficient to **build internal expertise**. This is particularly the case for areas of research that need to be frequently repeated or updated, or that require a strong understanding of the City's business and processes. One area that the City is focussing on building, for example, is more dedicated specialist research and analysis capacity in economic project appraisal.

The City has invested in economic analysis capabilities since 2000. In the earlier days this focussed on assisting with analysing macro-economic and sector trends in the economic and enterprise development department. However, with the ODTP in 2016/17, the unit shifted to the Policy and Strategy department. In 2019, the **economic analysis unit** became its own branch, including a new mandate to apply micro-economics tools to City decision-making across the City as a whole, rather than just focussing on analysis of the economy.

The division arose from the need to understand the impact of large-scale projects pre-implementation - a lesson learnt following examples of projects which did not deliver the expected returns. The economics analysis unit was trained by external partners to strengthen the team's methodological understanding of economic modelling. Training involved creating use-cases and prototypes for Cost Benefit Analyses, Randomised Control Trials, and other economic scenario modelling methods. Assessments using these tools have been done for the City's Transport department and the Water and Sanitation department.

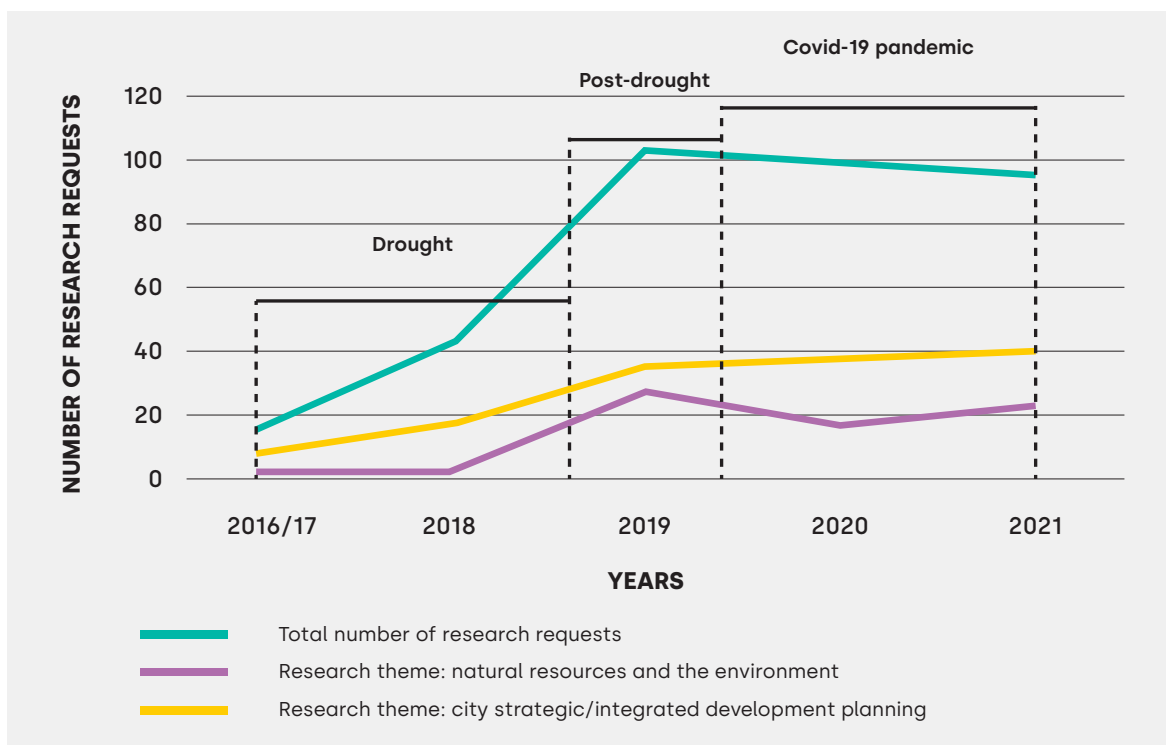
In terms of research that the City facilitates, the City continues to grapple with managing external research requests. This is especially a challenge during times of crisis, when request volumes increase significantly. This can be seen in Graph 1 below, where the total number of research requests increased dramatically over the years, but specifically during and post-drought, and remaining steadily high during the Covid-19 pandemic. This can also, in part, be attributed to the City having a coherent research request application process, aligned with its Research Framework and SOPs, in place by 2019.

Assisting with access to data and participating in interviews can be a drain on City resources if external researchers do not return their analyses back to the City.

While the City does its best to facilitate these requests, assisting with access to data and participating in interviews can be a drain on City resources in terms of staff time. The value generated in return by the City is also currently relatively low, as external researchers often fail to report back on or submit their analysis or research reports to the City.

A custom online **research request application portal** is currently (2022) under development in-house by the City, to manage requests and address the challenge of deriving value from research done using the City's data and other resources. The portal is a progression from using SharePoint and emails for research applications, and will also help with service efficiencies, risk management, and research sustainability. As more data is added to the open data portal, the hope is that this may also reduce the number of research requests.

**Graph 1: Number of research requests and number of research requests by theme, received by the City per year (2016/17-2021) and in relation to various crises<sup>52</sup>**



<sup>52</sup> Adapted from City of Cape Town research request data, 2022.

## Box 7: Using research to inform City decisions

### SUCCESS FACTORS

- ✓ Having a central research unit enables **maintenance of core City data sets**, as well as standardised research processes across departments, aligning research to core City objectives.
- ✓ **Cross-departmental relationships** can help build organisation-wide maturity, particularly by a RCoP.
- ✓ **Leveraging expert input** from external researchers to formalise and support research priorities, and to address research gaps.
- ✓ The maturation of processes and tools for **managing external research requests** to improve relationships with universities, and increase the relevance of research they are conducting.

### CHALLENGES

- ✗ **Research can be under-valued** in a resource constrained environment, and it takes time to build a culture of evidence-based decision making.
- ✗ **Uneven research maturity** organisation-wide slows down internal commitment and impact.
- ✗ Managing relationships with external researchers, including **drawing benefits from research** completed.
- ✗ **Balancing the time pressure to move from research to implementation** with the quality of research and depth of engagement with research findings.
- ✗ **Working in silos** inhibits transversal research projects for broader City problem solving and enhanced outcomes.

## Use-case: data and research for decision making in times of crises

Crisis events have often initiated a rapid maturation in the use and application of City data and research. Officials must make critical decisions under pressure with limited precedence, and need to find new ways of responding, communicating, and aligning with the public. Two recent cases stand out: the 2017/18 drought in Cape Town, and the 2020/21 Covid-19 pandemic.

### 2017/18 drought<sup>53</sup>

During the 1-in-300-year drought, real-time data on water usage, dam storage, and pipe condition was used internally to monitor water levels, target maintenance, and drive down consumption. Planning for the event that dams ran out of extractable water also relied on the Social Vulnerability Index (SVI), the Informal Settlements' specific Vulnerability Index, and the Economic Nodes Index; which City Research, Policy, Planning, Housing, and Data colleagues built from existing City census data and other administration data.<sup>54</sup>

Data visualisation and real-time data sharing tools were also used as part of the 2018 #DayZero communications campaign to induce behaviour changes, including:

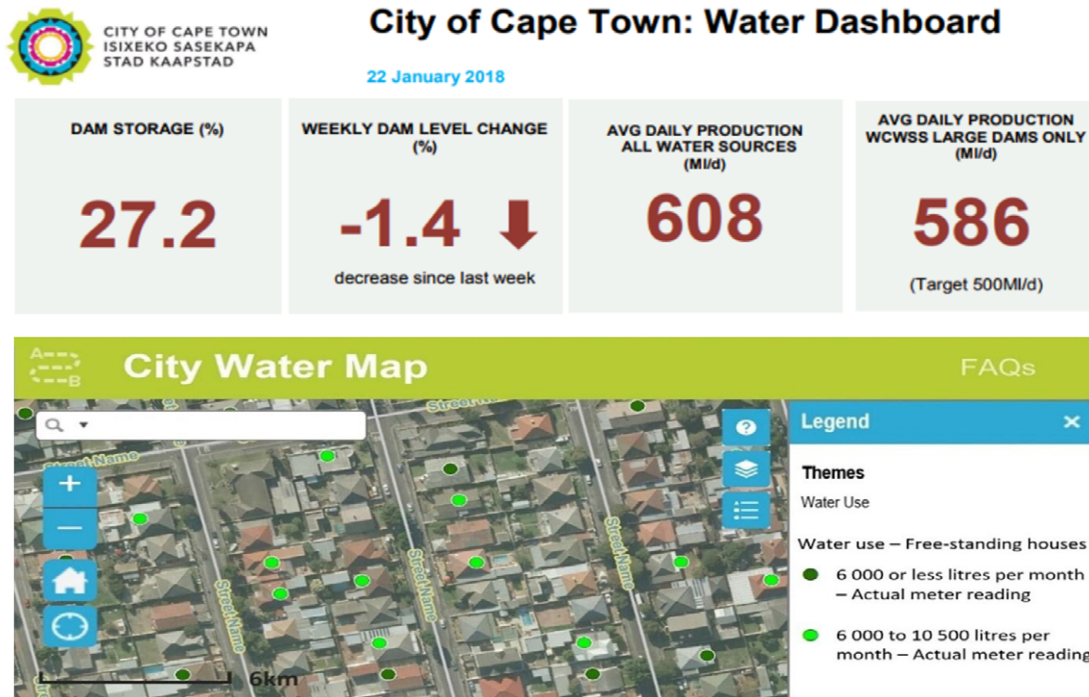
- The **Water Dashboard** which reflected the City's weekly dam storage percentages, weekly dam level changes, and average daily water production. The data was sourced from existing administrative data from the Bulk Water department. This innovation continues to be used for weekly updates in 2022.
- The City's **Water Usage Map ('Green Dot Map')** was published, reflecting household water consumption levels and neighbourhood water usage, using the City's water billings data. Households would be awarded "green dot status" for exceptional water saving, enabling peer-to-peer monitoring and competition.

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<sup>53</sup> For more information on the drought, see <https://www.drought-response-learning-initiative.org>

<sup>54</sup> Cole et al. (2021), Managing city-scale slow-onset disasters: Learning from Cape Town's 2015–2018 drought disaster planning, *International Journal of Disaster Risk Reduction*.

Figure 10: CCT Water Dashboard<sup>55</sup> and Water Map ('Green dot map')<sup>56</sup>



Building these tools required cross-departmental collaboration between Water, Communications, Legal, Finance, IS&T, and IKM's corporate GIS unit. CCT's Research unit, in consultation with other City colleagues in Policy, Spatial Planning, and Data Science helped to review approaches, source data, and adapt indices to inform planning alongside external research partners, and also assisted the Water and Sanitation department with their large volume of research requests at the time.

By 2018, as a result of these initiatives, the city's consumption had reduced from 1.2 billion MLD to 516 MLD, making Cape Town the first city globally to reduce consumption by more than 50% in 3 years<sup>57</sup>. Subsequent research has also shown that the DayZero communication campaign (including its data sharing and visualisation efforts) was more effective at encouraging water saving than changes in water tariffs.<sup>58</sup>

55 Adapted from City of Cape Town (2022), Dam Levels <https://www.capetown.gov.za/Family%20and%20home/residential-utility-services/residential-water-and-sanitation-services/this-weeks-dam-levels>

56 City of Cape Town Policy and Strategy department (2020), *Corporate Services Portfolio Committee: Role of Data in support of Decision-Making* [Powerpoint slides].

57 Wallace (2021), *Avoiding Day Zero: How Cape Town cut its water usage by 50% in three years*, Oxfam.

58 Matikinca, Ziervogel and Enqvist (2020), *Drought response impacts on household water use practices in Cape Town, South Africa*, Water Policy.

## Covid-19 pandemic

The announcement by the South African government of Alert Level 5 Lockdown in March 2020 during the Covid-19 pandemic presented another unanticipated crisis for the City to tackle. Building on the experience of the drought, City staff and working groups who were involved in the overall data and research effort were drawn on for the City's Covid-19 response.

The City established the COVID-19 Coordination Committee (CCC), chaired by the City's Chief Data Officer. Establishing the CCC meant that the City had a single executive leading the response, while working across the City's traditional silos. This allowed data to be used across the silos and a consistent data-driven decision approach to prevail. The CCC created work streams consisting of project teams across the City, which provided them with the tools for understanding information flows, risks, and trade-offs across the broader planning efforts.

A dedicated data workstream was set up to identify and access relevant data, and the data science team and the new economic analysis research unit were also drawn on in modelling various scenarios. Data sharing agreements were also urgently established between the City and the provincial Western Cape Government's Department of Health (WCGov DoH) to access needed data.

A number of City **data tools were designed for organisational readiness, responsiveness, and continued service delivery**<sup>59</sup>:

- *A clinics model* to depict clinic capacity, overflow, and impact on staff and materials.
- *An HR capacity data tool* to reflect daily staff status (i.e., sick leave, working from home, in quarantine, etc), which informed line manager decisions.
- *An operational dashboard* to depict and compare international and national pandemic statuses, behaviour insight data from resident social media responses, and an overview of business continuity from a multi-department co-ordinating committee, which informed senior leadership decisions.

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<sup>59</sup> City of Cape Town Policy and Strategy department (2020), *Corporate Services Portfolio Committee: Role of Data in support of Decision-Making* [Powerpoint slides].

## Data projections also informed related policy and planning responses<sup>60</sup>:

- A *fatalities management dashboard* was developed in May 2020 for internal use representing overall deaths - weekly, daily, per neighbourhood, and overall for Cape Town. Total deaths in a normal year were also recorded and compared with Home Affairs recorded deaths and with deaths predicted from hospital numbers, in order to get a more holistic idea of the pandemic fatality impact.
- A *vulnerability viewer dashboard and map* were built in July 2020, layering Covid-19 data with spatial data on vulnerable people (>55yrs) and places (e.g., old age homes, high density informal settlements, high risk economic nodes) at the lowest level of disaggregation, as well as the SVI. This allowed for targeted, strategic interventions in those areas, building on the vulnerability work done during the drought.
- A *financial scenarios model* helped determine the pandemic's financial implications on the organisation, population, various sectors, and spatial locations. City consumption and payments data was fed into the model for every property, to replicate potential bills. The model accounted for likely shifts in consumption, which were informed by economic scenario modelling, and for shifts in credit risk analysis, informed by payment and credit bureau data.
- A *decision support tool* outlined the 5-step process for decision-makers to use in evaluating the trade-offs for proposed courses of action (see **Figure 11**).
- The *quarantine and isolation (Q&I) strategy and work stream* used Q&I demand forecast modelling, as well as mapping of SVI and possible Q&I facilities, to present the needs, costs, and logistics to decision-makers.

The CCT Research unit, again working with data science and other City colleagues, for example from Health and Spatial Planning, played an important role in sourcing data and advising on planning responses by analysing trends and vulnerability approaches, along with external research partners. The unit also used the data and tools to inform City resilience-building, incorporating drought insights.

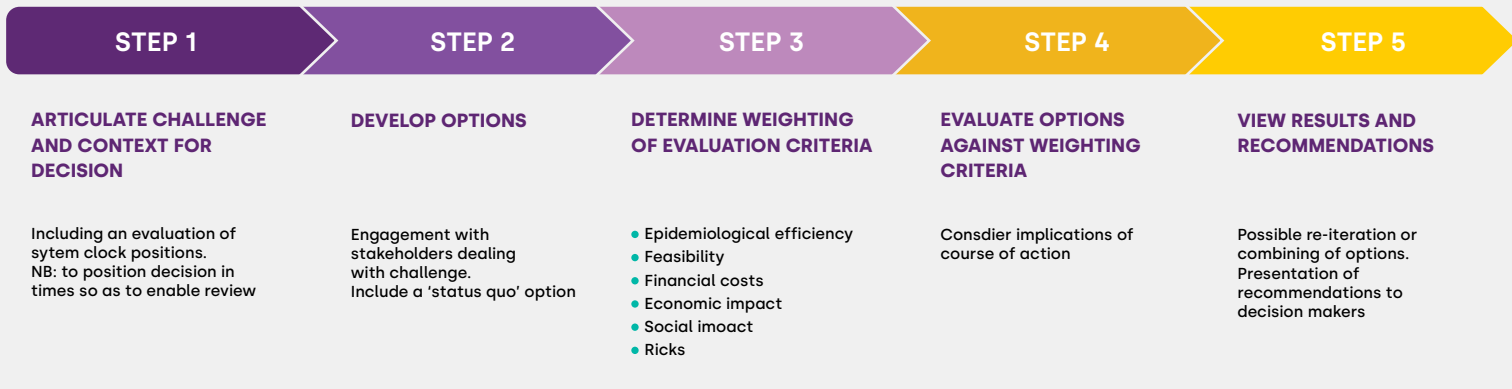
By September 2020 there was relative stability and lockdown restrictions eased, and recovery planning became the priority. This included scenario planning and projections, economic and financial impact modelling and social impact assessment and projections.

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<sup>60</sup> City of Cape Town Policy and Strategy department (2020), *Corporate Services Portfolio Committee: Role of Data in support of Decision-Making* [Powerpoint slides].



**Figure 11: CCT Covid-19 pandemic decision support tool 5-step evaluation process<sup>61</sup>**



Overall, the value of data and research for evidence-based decisions received high exposure and was widely regarded in the City during these times of crisis, with success largely attributed to the City's long-term and intentional investment in the various data and research skills, infrastructure, and process over the last 20 years. However, maintaining this momentum is difficult, as outside of crisis conditions the innovation often loses momentum and doesn't get sustained. Finding ways of mainstreaming innovations during and post periods of crisis will need to be a key consideration in future.

<sup>61</sup> City of Cape Town Policy and Strategy department (2020), *Corporate Services Portfolio Committee: Role of Data in support of Decision-Making* [Powerpoint slides].

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## Looking forward

With the City's five year political and IDP cycle starting again in 2022, a new plan has been set alongside changes to the organisational structure. Data and research now fall under a newly created division called '**Future Planning and Resilience**' rather than 'Corporate Services', emphasising their role in strategic planning and decision making. The IKM and IS&T departments still fall under Corporate Services, showcasing their role as enablers or tools.

In addition to the ongoing implementation and updating of the various strategies and frameworks, and deepening external research and data partnerships and programmes, the new Mayor has placed great emphasis on **Open Data for Open Government** - whereby openness in data is considered as a springboard for transparent and responsive governance<sup>62</sup>. Work is therefore being undertaken to improve the functionality and usability of the Open Data Portal and access to new, previously hidden datasets, as well as in building new ways for the City to interact with and capture the needs of all residents in the City.

The City's Core Application Refresh (**CAR**) process is also ongoing, and alongside it a CCT **digital government strategy** is being developed, aiming to ensure the City is future-ready in terms of new IT infrastructure investments.

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<sup>62</sup> Hill-Lewis (2022), Open Government in Cape Town [A message from the Executive Mayor].

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## Key Lessons

For other cities looking to implement similar reforms in using data and research to improve city outcomes, a few noteworthy lessons emerge:

### **Don't let technology drive your business.**

Strategies for automation of business processes, as well as the use of data and research, should be led by the business outcomes and values you are trying to achieve. Understand your business needs, and then determine which kinds of IT systems, and what data and research are needed to iteratively collect that data, while also responding to and automating your business needs. Any investment will lock the organisation in for a period, and the costs and benefits will need to be understood.

### **Pro-actively monitor and adapt to the rapidly changing technology landscape.**

All decisions were made at a point in time with the technology available at the time. But as technology changes, so too does the possible best option. Technology changes rapidly, and local governments must dedicate time and resources to monitoring how the technology landscape is changing, and how these changes may affect the organisation and evolving business needs. This includes making time to regularly take stock of, review, and improve existing processes. In this way, strategies, programmes, and implementation can be adapted over time, to ensure that the technology in use continues to serve the business needs.

### **Invest in a variety of in-house capabilities – not only to support data, research, and technology initiatives, but also to hold service providers to account.**

A variety of in-house capabilities are necessary in related data, information, statistics, and research roles, to maintain core systems and build maturity. This also helps to hold service providers, vendors, and other external partners to account, and ensure that the benefits of the proposed solutions outweigh the costs, and that they are meeting the City's business needs. New skills and transversal teams should share the common understanding and goal of data as a shared public asset, and should be supported by clear leadership.

### **Ensure all systems and their data are designed for integration and sharing from the outset.**

This requires standardised data formatting, and clear metadata descriptions, so that data can be automatically combined and transferred across different departments and systems to perform different functions. The right way to integrate different types of data in an organisation will depend on the local institutional structure.

For example, in Cape Town, where all functions are housed under one institution, the response will be very different to that in London - where each borough has its own structures and there are a variety of agencies with different responsibilities, requiring an external London Data Store.<sup>63</sup>

**Data, research, and IKM should be embedded as key roles and activities in supporting service delivery and infrastructure investments.**

Digitalisation and data sharing often brings resistance, and research and knowledge management can be de-prioritised. Change management and building organisation-wide maturity through new projects and tools which support business needs, and sharing lessons across departments, is therefore an important part of creating a culture of evidence-based decision-making and open government.

**Leverage moments of change to advance innovation, and make sure to institutionalise successes across the organisation.**

These moments of change could refer to historic moments, such as the creation of the UniCity, or the crisis events of the drought and pandemic, which necessitated rapid innovation and decision-making. It is important for cities to take stock of lessons learnt during these moments and create processes to institutionalise them. Important aspects to consider may be which kinds of agreements or relationships were needed to access the data, which kinds of skills needed to be sourced in-house or externally, which tools were necessary for processing and implementing, and how the organisational structure needed to be amended to accommodate new ways of working.

**Understand the 'digital divide' in your city.**

Understand the information on the 'digital divide' and its implications in your city - who is left out when using administrative data in decision making. Especially in developing country contexts, local governments risk misrepresenting the population and making incorrect decisions by not capturing information on informal sectors. Furthermore, it is important to understand how new digital technologies may exclude certain residents from connecting with the City in new digital formats. Alternative methods should be innovated or leveraged to support those who are left out, while taking care to account for privacy and data ownership considerations.

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<sup>63</sup> See <https://data.london.gov.uk> for more information.

## **The case study was informed through interviews with the following stakeholders:**

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From the Development Management department, Marius Crous (Manager: Business Systems) and Peta Barnard (Senior GIS Technician: Business Systems);

From the Information and Knowledge Management (IKM) department, Keith Smith (Director: Information and Knowledge Management), Vernon Bowers (Manager: Knowledge Management) and Neil Hoorn (Senior Professional Officer IKM and Open Data Project Manager);

From the Information Systems and Technology (IS&T) department, Mehboob Foflonker (Manager Architecture and Governance; previous Manager: ERP Support Centre and previous Director Architecture) and Adri Janse van Rensburg (Manager: ERP Support Centre), Shuaib Parker (Manager: Infrastructure – IS&T), Andre Ford (Project Co-ordinator: Infrastructure, IS&T), and Omeshnee Naidoo (IS&T Director and Chief Information Officer)

From Organisational Performance Management Department, Delyno Du Toit (Manager: Organisational Performance Management – Data Science), Gordon Inggs (Principle Professional Officer: Data Science) and Riaz Arbi (Principle Professional Officer: Data Science, now former CCT employee);

From the Policy and Strategy department, Yogini Jivanji (Policy Researcher), Hugh Cole (Director), Carol Wright (Manager: Research) and Natasha Primo (Head: Organisational Research);

From the Communications department, Justin Lawrence (Manager: Digital Communications);

From the Transport department, Jaco Muller (Head: Business Intelligence) and Biondello Leonie (Head: Technology support);

From the Electricity department, Donovan Leeuwendaal (Manager: Finance and Commercial Engineering, Electricity Generation and Distribution) and Jonathan Traut (Head: GIS and Electricity Generation and Distribution);

From the Water and Sanitation department, Jaco De Bruyn (Manager: Water Demand Management) and Ken Sinclair-Smith (Principal Planning Officer: Business, GIS and Spatial Information);

From the Solid Waste Management department, Othelie Muller (Head: Management and Geographical Information) and Barry Coetzee (Head: Contract Management)

## **Stakeholders external to the City of Cape Town at the time of the research:**

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Andre Stelzner (IT advisor RAK, previous SAP implementation and Chief Information Officer at CCT), Nirvesh Sooful (African Ideas Corporation Pty Ltd., previous Chief Information Officer at CCT), Craig Kesson (Partner, Government and Public Sector, PwC South Africa, previous Director and Executive Director: Corporate Services and Chief Data Officer), Dr Greg Munro (Director: Cities Alliance, previous Director of Policy and Strategy, CCT) and Donovan Muller (consultant, previously Accenture Advisor to CCT Smart City Strategy ERP implementation).



# Cities that Work

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