Singapore Water Center

Water Solutions for a Livable Planet

Digital Public Infrastructure in the Water Sector

The case of Singapore: PUB's Digital Journey



WORLD BANK GROUP

IIWW

Water Forward

FOR PEOPLE FOR FOOD FOR PLANET

PF9

September 25, 2026

About Singapore



744.3 km^2
Land Area

6.11 million
Population

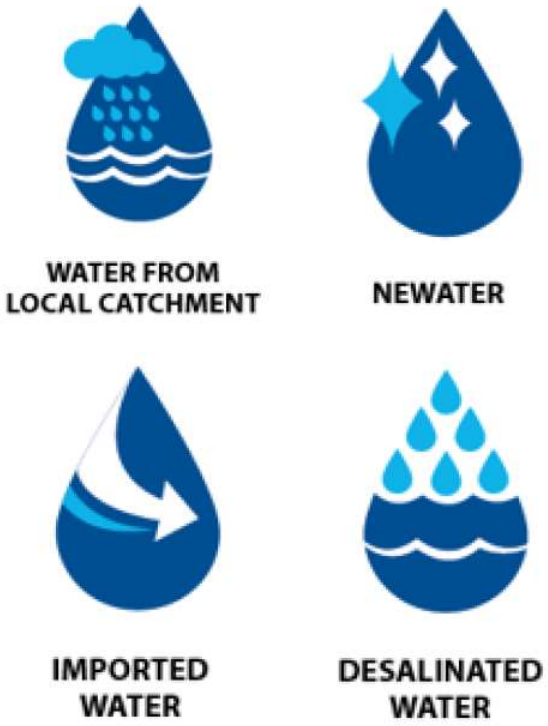
2,534 mm
Annual Rainfall

440 MGD (Imperial)
Water Demand

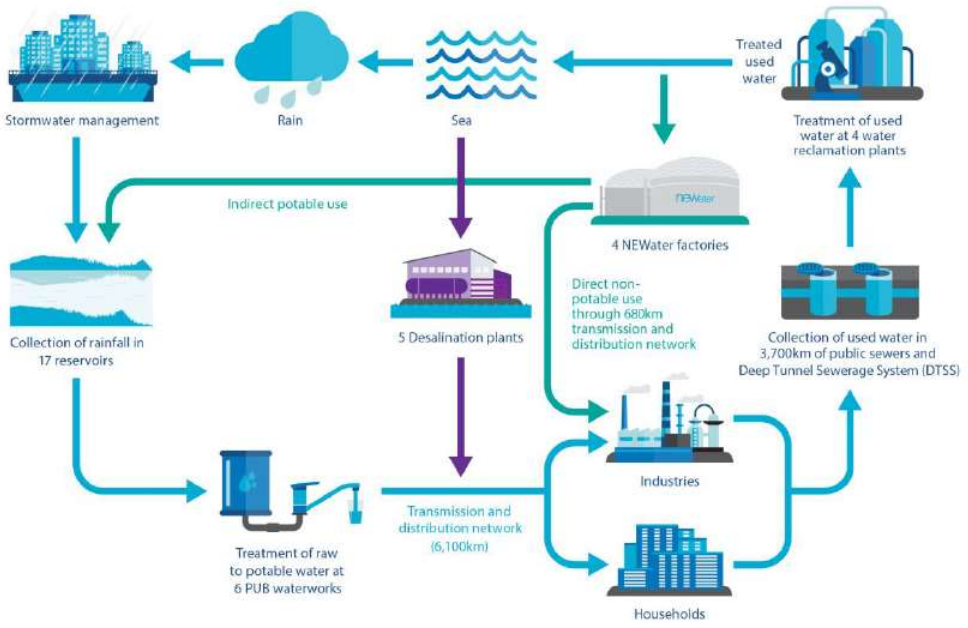
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Singapore's Water Sources

Singapore's 4 National Taps



PUB Water Loop



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SINGAPORE'S WATER SECTOR DIGITALISATION JOURNEY

From automation to operational intelligence

Each technology wave responded to a new operational challenge, while expanding PUB's capacity to see, coordinate and act.

EVOLUTION OF THE OPERATING MODEL
Observe → Integrate → Anticipate → Act



1980s

AUTOMATE

WHY

Growing treatment capacity demanded safer, more consistent process control.

WHAT CHANGED

SCADA, online instruments and automated dosing, filtration and pumping replaced manual monitoring.

Plant operations became visible and controllable in real time.

1990s

MAP & MODEL

WHY

A larger, denser network could no longer be managed reliably through paper records.

WHAT CHANGED

GIS, hydraulic models and computerised customer systems created a spatial and analytical view of assets and demand.

Decisions shifted from local knowledge to network-based planning.

2000s

CONNECT

WHY

NEWater, desalination and the Water Safety Plan increased the need for continuous assurance across sources.

WHAT CHANGED

Sensor grids, reservoir buoys and integrated operations linked water quality and operating data across the supply chain.

PUB moved from plant monitoring to whole-system situational awareness.

2010s

ANTICIPATE

WHY

Mature infrastructure required earlier detection of leaks, pressure risks and process deviations.

WHAT CHANGED

WaterWise, acoustic sensing, pressure management and digital twins enabled proactive and simulated operations.

Cybersecurity became a strategic operational priority as IT and OT converged.

2022+

INTELLIGENCE

WHY

The next frontier was to turn abundant data into faster decisions, customer action and autonomous performance.

WHAT CHANGED

300,000 smart meters, AI, predictive diagnostics and Smart WRP extend intelligence from network to customer and plant.

Direction: a Smart Water Grid that predicts, recommends and increasingly acts.

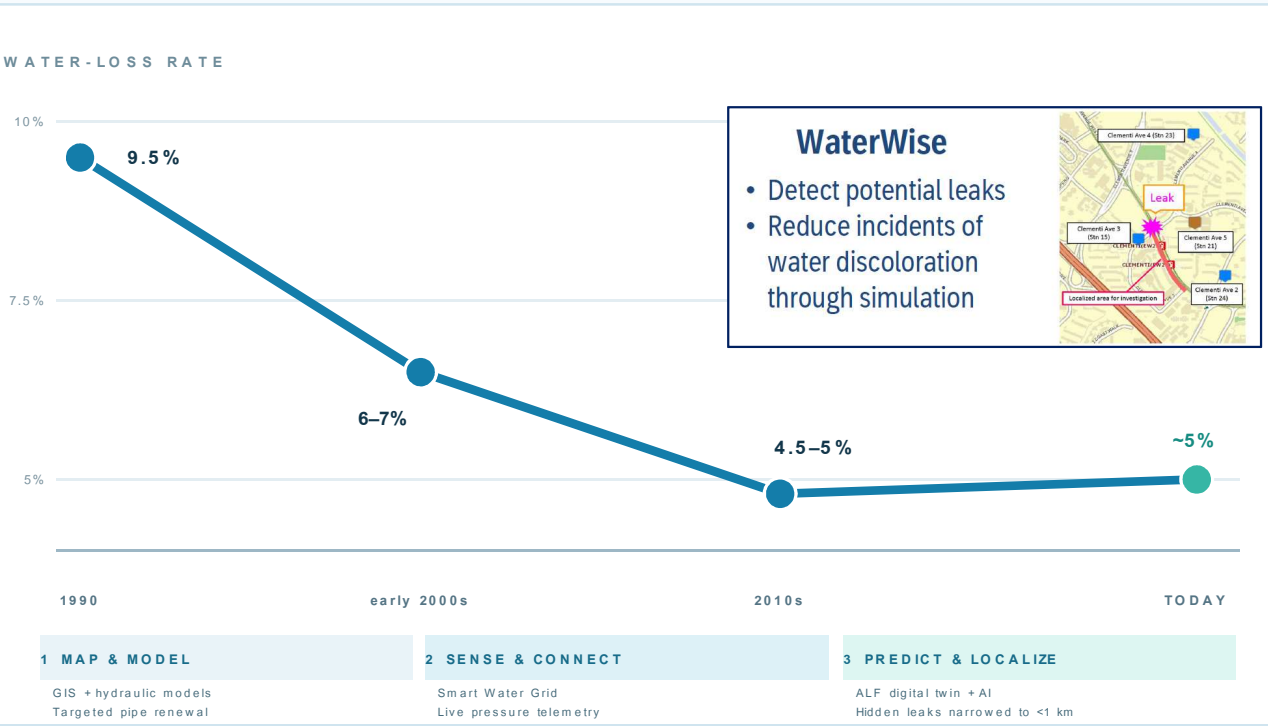
ENDURING LOGIC Start with the operational problem • pilot before scaling • integrate across the water cycle • strengthen governance, cyber resilience and human capability

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DIGITAL LAYERS DID NOT CREATE ONE BIG DROP

They progressively flattened the loss curve

As the pipe network expanded, each digital era added a new safeguard: map → sense → predict.





6,000+ km of underground network while losses remain near 5%

LATEST DIGITAL LAYER

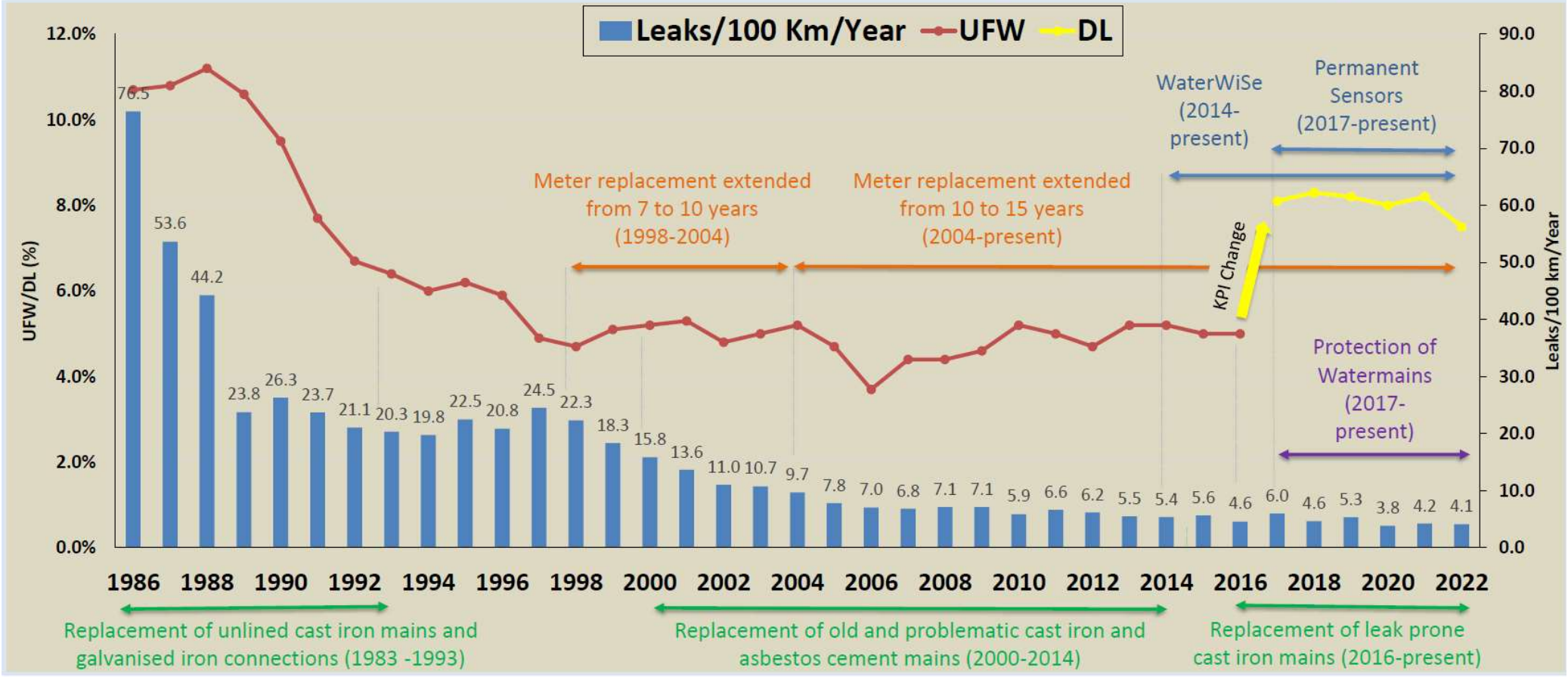
80% + anomaly-detection accuracy using historical + live data

CORE MESSAGE

Digital maturity has become a permanent efficiency safeguard, not a one-off intervention.

Source synthesis: user-provided material; CSC Knowledge; PUB ASR 2024/25; Bentley Systems

Unaccounted-for-Water (UFW) & Distribution Loss (DL) & Leaks/100 Km/year



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PUB digitalisation: built on national digital public infrastructure

The hidden accelerator: shared national systems reduced cost, complexity and time to scale.

2014 SMART NATION PROGRAM — data sharing • cybersecurity • procurement • digital talent

Shared policy, governance and technology foundation

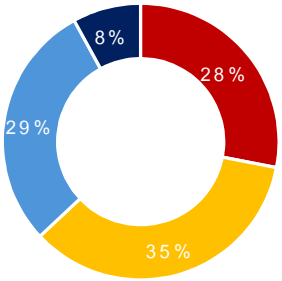
01	Ubiquitous connectivity	National fibre + wireless backbone supports island-wide sensors, real-time monitoring and smart grids.
02	Cross-utility network reuse	300,000 smart water meters leverage SP Group's Wi-SUN electricity-meter mesh, avoiding a separate network.
03	National digital identity	MySmartWaterMeter uses Singpass: one trusted login, lower friction and no proprietary identity stack.
04	Common data + digital platforms	Shared enterprise systems and inter-agency data exchange let PUB focus investment on water-specific solutions.



Are the technology foundations in place?

Technology, data and IT

What is the maturity of the organization regarding data management?

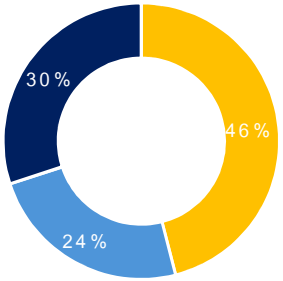


- Beginner: data are managed at the system level with no specific processes or tools to monitor quality and risks associated with data management
- Tactical: key processes are in place for critical applications and data flows
- Strong: most processes, roles and tools are in place to maintain a high level of data quality and security across the systems
- Expert: data management is at the center of decision-making, with established data leadership, governance, tools, infrastructure and monitoring

Key message 1

Organizations have a reasonable understanding of what it takes to manage data, **although nearly 2/3 of them are still beginners** with basic awareness or short-term thinking

What is the overall approach/maturity regarding the use of AI in your organization?



- No pilot projects or experiments are underway: focus is on understanding AI possibilities and potential applications
- AI awareness: discussions about AI are occurring, but without a strategic direction
- Experimentation: the company is conducting pilot projects and small-scale AI initiatives. Hands-on experience is being gained through limited AI applications. AI projects are in proof of concept or experimental phases

Key message 2

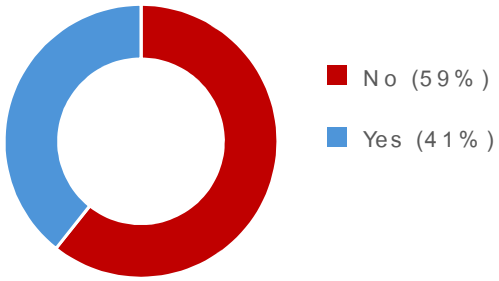
AI is present in the LMIC water sector, although **~50% have yet to launch a project or pilot** for specific use cases

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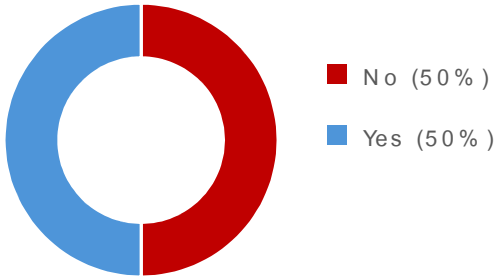
Are utilities ready to orchestrate the change?

Digital vision, governance and cybersecurity

Have you clearly defined your company's digital vision and documented the digital strategy?



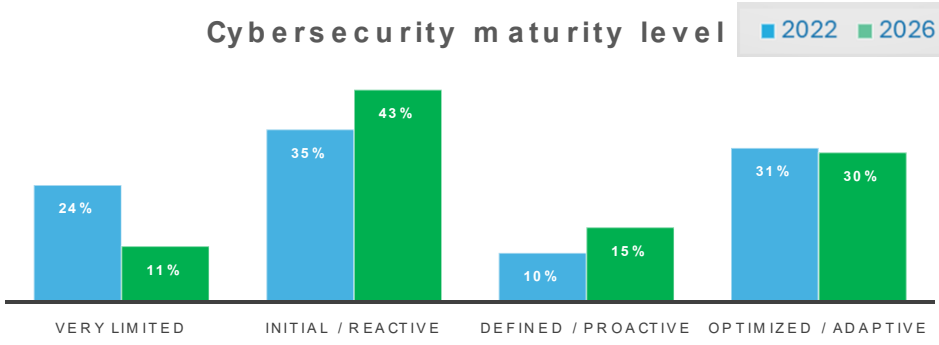
Does your organization have a central committee to drive the digital journey, prioritize initiatives, and allocate the right level of resources?



Key message 3

Majority of companies have yet to formalize a digital strategy or put in place the organizational structures (and dedicated budgets) needed to execute one, reflecting a digital transformation journey that remains largely limited/tactical (>75%) and fragmented rather than guided by a clear vision and governance

Cybersecurity maturity level



Key message 4

More than 50% of companies either have basic processes and policies in place or have limited resources to go beyond an antispam or firewall ⟶ Pressing need to strengthen cybersecurity

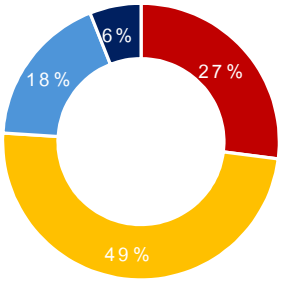
Gaps in culture, skills, and safeguards to generate value from data

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Are utilities connected enough?

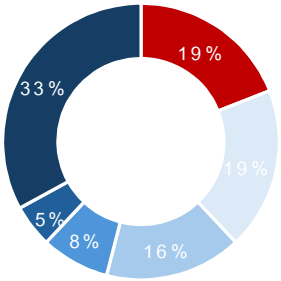
Collaboration and innovation ecosystem

How digitally integrated is your utility with suppliers and partners?



- No digital process in place to deal with vendors and suppliers
- Possibility to do some of the admin tasks electronically, i.e. response to tenders, invoicing, etc.
- Most of the key interactions with suppliers are done electronically, incl. quotations, goods receipt, invoicing, etc.
- All suppliers have an online account and can digitally interact with the utility via a dedicated platform which includes a range of services (procure to pay)

How is the utility connected and working with the innovation ecosystem?



- No specific link
- Peer discussions with other utilities
- Established cooperation with universities
- Link with existing public digital departments or ministries
- Member of target groups (user-centric or participatory innovation)
- Formal partnerships with startup incubators

Key message

5

While utilities demonstrate meaningful engagement with the broader innovation ecosystem, their digital collaboration with vendors and suppliers remains largely transactional, suggesting that external connectivity has yet to translate into deeper operational integration across the value chain

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Recommendations to take this to the next level

- **Pockets of genuine progress coexist with structural barriers.** While utilities show encouraging progress in smart operations, maturity levels remain foundational, reflecting a slow momentum of institutional adaptation that technology advancement alone cannot compensate for. To avoid turning digital ambition into stagnation, there is a need to, in particular:
  - ***Set up*** the appropriate governance structures with a comprehensive vision and roadmap from strategy to execution: digital leadership is needed
  - ***Invest in*** robust data management skills: there is limited maturity in data governance, as well as in cybersecurity
  - ***Conduct*** skill gap assessments and develop targeted trainings to build workforce digital capability
  - ***Strengthen*** external collaboration and break down silos: Actively engage the broader innovation ecosystem to accelerate knowledge sharing
- Digitalization is a complex, non-linear process, and there is a need to create a successful digital water ecosystem → **Actors in the water sector should evolve together in order to create an operational and information ecosystem that is interoperable and safe**

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Thank you!

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