WATER INTELLIGENCE PLATFORM SUITE

Three Integrated SaaS Platforms for Singapore's Water Sector

Platform 1: Water Compliance & Quality Management
AI-Powered Compliance • Real-Time Monitoring • Regulatory Reporting

Platform 2: Digital Twin for Water Infrastructure
SCADA Integration • Hydraulic Simulation • 3D Visualization

Platform 3: Asset Intelligence & Risk Management
Failure Prediction • Capital Optimization • Predictive Maintenance

Complete Water Management Ecosystem

Compliance Automation • Network Optimization
Asset Risk Management • Predictive Analytics
Real-Time Intelligence • Climate Resilience

Prepared for:
Singapore Water Sector

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November 12, 2025

1 Executive Summary

Singapore's water sector faces unique challenges: water security, aging infrastructure, climate resilience, and operational efficiency. We offer three interconnected AI-powered SaaS platforms that transform water management through intelligent automation, predictive analytics, and real-time decision support.

1.1 Integrated Platform Suite

Platform 1: Water Compliance & Quality Management
Automated regulatory compliance, AI-powered water quality analysis, intelligent reporting for PUB Water Watch and NEA requirements.

Platform 2: Digital Twin for Water Infrastructure
Real-time network modeling with SCADA integration, hydraulic simulation, 3D visualization, and predictive operations.

Platform 3: Asset Intelligence & Risk Management
ML-powered failure prediction, risk-based capital planning, and predictive maintenance for water infrastructure assets.

1.2 Value Proposition for Singapore

- **80% reduction in manual compliance work** through automation
- **15-30% energy cost savings** via optimized pump scheduling
- **15-25% improvement in capital allocation** through predictive analytics
- **40% faster emergency response** with real-time digital twin
- **3-5% reduction in non-revenue water** through leak detection
- **Climate resilience** via scenario modeling and adaptive planning

1.3 Combined ROI

Mid-Size Utility (100,000 connections):

Annual Benefit	SGD
Avoided failure costs	$2-5M
Energy optimization savings	$600-900K
Staff productivity gains	$400-600K
Non-revenue water reduction	$300-500K
Compliance cost avoidance	$200-400K
Total Annual Value	**$3.5-7.4M**
Platform Investment	**$200-300K/year**
ROI	**15:1 to 25:1**

2 Platform 1: Water Compliance & Quality Management

2.1 Overview

Production-ready regulatory compliance management system with AI-powered water quality analysis, originally developed for New Zealand's Taumata Arowai but fully adaptable to Singapore's PUB and NEA requirements.

2.2 Core Capabilities

- **AI-Powered Water Quality Analysis:** Claude 3.5 Sonnet for intelligent interpretation
- **Real-Time Monitoring:** Multi-parameter tracking with automated alerts
- **Anomaly Detection:** Statistical and ML-based quality excursion identification
- **Automated Reporting:** PUB-compliant reports, Excel exports, dashboards
- **Document Management:** S3 direct upload, version control, 7-year retention
- **Compliance Scoring:** 6-component weighted system with actionable recommendations
- **Audit Logging:** Immutable 7-year audit trails for regulatory compliance

2.3 Technology Stack

Component	Technology
AI Engine	Anthropic Claude 3.5 Sonnet
Backend	Node.js 20, TypeScript, Fastify
Database	PostgreSQL 15 (7+ year retention)
Cache	Redis 7 (40x performance boost)
API	60+ RESTful endpoints
Frontend	Next.js 15, React 19, TailwindCSS
Security	JWT, AES-256, TLS 1.3, RBAC

2.4 Key Features

1. Intelligent Water Quality Monitoring

- Real-time tracking of E. coli, turbidity, pH, chlorine, nitrates, heavy metals
- AI identifies statistical anomalies, trend changes, seasonal patterns
- Multi-parameter correlation analysis
- Treatment efficacy monitoring

2. 24/7 AI Compliance Assistant

- Conversational AI for regulatory questions (PUB Water Watch, NEA)
- Treatment optimization recommendations
- Incident response procedures
- Best practice guidance

3. Automated Compliance Scoring

- 6-component weighted system: Documentation (35%), Asset Management (20%), Reporting (15%), Risk Management (10%), Timeliness (5%)
- Historical trend tracking
- Severity-ranked recommendations
- Executive dashboards for boards/councils

4. Document Intelligence

- AI analyzes water safety plans and HACCP documents
- Identifies missing mandatory elements
- Generates gap analysis reports with completeness scores
- Regulatory submission-ready exports

2.5 Singapore-Specific Applications

NEWater Facilities:

- Monitor RO permeate quality parameters
- Ensure drinking water standard compliance
- Track membrane performance and fouling
- Automated PUB reporting

Desalination Plants:

- Feedwater quality monitoring
- Chemical dosing optimization
- Energy efficiency tracking (kWh/m^3)
- Predictive maintenance alerts

Food & Beverage Industry:

- Process water quality verification
- HACCP compliance documentation
- NEA licensing support
- Supplier quality audits

Research Institutions (NUS/NTU/SMART):

- Wastewater-based epidemiology (COVID-19, dengue)
- AMR gene surveillance
- Microplastics and emerging contaminant studies
- Unlimited historical storage for long-term research

3 Platform 2: Digital Twin for Water Infrastructure

3.1 Overview

Real-time digital replica of water/wastewater networks enabling predictive operations, emergency response, and infrastructure optimization through SCADA integration, hydraulic simulation, and immersive 3D visualization.

3.2 Core Capabilities

- **Live 3D Digital Twin:** Interactive visualization of entire network
- **SCADA Integration:** OPC UA connectivity for real-time data
- **Hydraulic Simulation:** EPANET 2.2 for industry-standard modeling
- **AI Predictive Analytics:** LSTM neural networks for demand forecasting
- **Energy Optimization:** Automated pump scheduling (15-30% savings)
- **Water Quality Tracking:** Chlorine decay, water age, contaminant spread
- **Emergency Response:** Pipe burst simulation, contamination modeling
- **AR/VR Capabilities:** Field operations and operator training

3.3   Technology Architecture

Component	Technology
Simulation Engine	Python 3.11 + EPANET 2.2 + WNTR
Visualization	Node.js 20 + Babylon.js + Three.js
SCADA Integration	Node.js 20 + OPC UA + MQTT
Analytics	Python + TensorFlow + scikit-learn
3D Engine	Babylon.js (web), Unity (VR/AR)
Database	PostgreSQL + PostGIS + InfluxDB
Real-time	WebSocket + Socket.io

3.4   Key Capabilities

1. Real-Time Network Operations

- Live pressure, flow, tank level monitoring
- Pump operation status and efficiency
- Valve position tracking
- Real-time vs. simulated comparison
- ¡ 50ms latency for 100,000+ network elements

2. Hydraulic Simulation & Optimization

- What-if scenario analysis for planning
- Fire flow adequacy testing
- System expansion modeling
- Pressure zone optimization
- Peak demand management

3. Water Quality Management

- Chlorine residual decay modeling
- Water age analysis throughout network
- Contamination event simulation and response
- Disinfection by-product tracking
- Flushing sequence optimization

4. Energy Optimization

- AI-powered pump scheduling based on demand forecasting
- Electricity rate optimization
- Tank cycling strategies
- Typical savings: 15-30% of pumping costs
- Automated control execution through SCADA

5. Emergency Response

- Pipe burst impact simulation (affected customers in seconds)
- Contamination spread modeling

- System isolation planning (valve closure sequences)

- Alternative supply routing

- Customer notification generation

6. Immersive Technologies

- AR mobile app for field crews (underground asset visualization)

- VR training environments for operators

- Emergency scenario simulation

- 60% faster operator proficiency

3.5   Singapore-Specific Use Cases

PUB Network Optimization:

- Model NEWater blending into distribution network

- Optimize blending ratios for cost and quality

- Pressure management in high-rise buildings

- Non-revenue water reduction through leak detection

Smart Water Grid Integration:

- Connect 800,000+ smart water meters

- Real-time consumption analytics

- Demand response programs

- Public transparency dashboards

Marina Barrage & Reservoirs:

- Hydraulic simulation of tidal barrier operations

- Rainfall-runoff water quality prediction

- Climate change scenario modeling (sea level rise)

- Algal bloom monitoring and prediction

Coastal Protection Planning:

- Model seawater intrusion risks

- Optimize desalination plant placement

- Simulate Long Island protection scenarios

- Storm surge impact analysis

4   Platform 3: Asset Intelligence & Risk Management

4.1   Overview

AI-powered SaaS platform that transforms reactive maintenance into predictive, data-driven infrastructure management using machine learning to predict failures with 70-85% accuracy and optimize capital spending.

4.2 Core Capabilities

- **Predictive Failure Analysis:** XGBoost ML models predict pipe/asset failures
- **Risk-Based Capital Planning:** Optimize budget allocation by risk, not age
- **AI-Powered Insights:** Claude generates plain-English recommendations
- **Asset Registry:** Centralized database with GIS integration
- **Scenario Modeling:** Multi-year budget forecasting and what-if analysis
- **Automated Reporting:** ISO 55000 compliant asset management reports
- **Integration Ready:** Connect to existing CMMS, GIS, ERP systems

4.3 Technology Stack

Component	Technology
ML/AI Engine	Python + XGBoost + Claude API
Frontend	Next.js 15 + React 19
Backend	Node.js 20 + Fastify
Database	PostgreSQL 15 + PostGIS
Infrastructure	AWS (ECS, RDS, S3, Lambda)
Cache	Redis 7

4.4 Key Features

1. Predictive Failure Modeling

- 70-85% accuracy using XGBoost algorithms
- Considers: age, material, soil conditions, pressure, failure history
- 3-month to 5-year failure probability predictions
- Confidence intervals and risk scores
- Continuous model improvement with new data

2. Risk Assessment Dashboard

- Real-time failure probability scoring for all assets
- Consequence-of-failure analysis (public safety, economic, environmental)
- Combined risk matrix (likelihood × consequence)
- Critical asset identification
- Interactive risk maps with GIS visualization

3. Capital Planning Optimization

- Risk-based prioritization instead of age-based
- Multi-year budget scenarios
- Cost-benefit analysis for each investment
- 15-25% improvement in capital allocation efficiency
- Board-ready presentations with ROI justification

4. AI Business Case Generator

- Claude AI generates natural language recommendations

- Executive summaries for council/board approval

- Automated ROI calculations

- Regulatory compliance justification

- Peer benchmarking across utilities

5. Predictive Maintenance Scheduling

- AI-optimized maintenance work orders

- Proactive interventions before failures

- Typical reduction: 30-40% in reactive maintenance

- Integration with existing CMMS (Maximo, SAP, Cityworks)

4.5   Value Delivered

Quantified Benefits for Mid-Size Utility:

Benefit Category	Annual Impact
Avoided catastrophic failures	$2-5M
Improved capital efficiency (15-25%)	$1.8-3M
Staff productivity savings (30-40%)	$300-400K
Non-revenue water reduction (3-5%)	$400-500K
Compliance cost avoidance	$500K-2M
Total Annual Value	**$5-10M**
Platform Cost	**$48-96K/year**
ROI	**50:1 to 200:1**
Payback Period	**2-4 weeks**

4.6   Singapore Applications

PUB Infrastructure Management:

- Predict failures in 5,600+ km water pipe network

- Optimize $2B+ water infrastructure capital budget

- Prioritize aging pipe replacement programs

- Reduce non-revenue water (currently ~5%)

NEWater & Desalination Assets:

- Monitor critical treatment asset health

- Predict membrane replacement needs

- Optimize maintenance schedules

- Minimize downtime of strategic facilities

Industrial Facilities (Jurong Island):

- Complex process water infrastructure management

- High consequence-of-failure assets

- Integration with plant CMMS systems

- Regulatory compliance documentation

5 Integrated Platform Synergies

5.1 Why Three Platforms Are Better Than One

When deployed together, the platforms create a comprehensive water intelligence ecosystem with powerful synergies:

Data Flow	Benefit
Platform 1 → Platform 2	Water quality data validates hydraulic model predictions
Platform 2 → Platform 3	Hydraulic stress analysis improves failure predictions
Platform 3 → Platform 1	Asset condition informs water quality risk assessment
Platform 1 → Platform 3	Compliance failures trigger asset investigation
Platform 2 → Platform 1	Flow anomalies alert quality monitoring system
Platform 3 → Platform 2	Planned shutdowns update network model

5.2 Example Integrated Workflow

Scenario: Contamination Event

1. **Platform 1** detects water quality anomaly at sampling point
2. Automatically alerts **Platform 2** to trace contamination source
3. **Platform 2** simulates contaminant transport in network
4. Identifies affected zones, generates isolation plan
5. **Platform 3** checks if failing assets may be the source
6. Operators execute valve closures through **Platform 2**
7. **Platform 1** tracks remediation effectiveness
8. **Platform 3** schedules asset replacement to prevent recurrence

Result: 80% faster response time, comprehensive root cause analysis, prevents future incidents

6 Data Management & Security

6.1 Enterprise-Grade Architecture

- **Database:** PostgreSQL 15 + PostGIS + TimescaleDB
- **Retention:** Unlimited (7+ years minimum for compliance)
- **Encryption:** AES-256 at rest, TLS 1.3 in transit
- **Authentication:** JWT tokens, multi-factor authentication
- **Authorization:** Role-based access control (RBAC)
- **Audit Trails:** Immutable logs, 7+ year retention
- **Compliance:** PDPA (Singapore), ISO 27001 ready
- **Hosting:** AWS Asia-Pacific (Singapore) - ap-southeast-1

6.2 API Integration

RESTful APIs with 60+ endpoints per platform:

- Authentication: JWT tokens (OAuth 2.0 compatible)
- Documentation: OpenAPI/Swagger specification
- Rate limiting: Configurable per organization
- Data formats: JSON, CSV, Excel, PDF, GeoJSON

Integration Scenarios:

1. **LIMS:** Automated laboratory result upload
2. **SCADA:** Real-time operational data streaming
3. **GIS:** Spatial data export/import (ArcGIS, QGIS)
4. **CMMS:** Work order synchronization (Maximo, SAP)
5. **ERP:** Financial data integration
6. **PUB Systems:** Secure regulatory data sharing

6.3 Performance Metrics

Metric	Performance
API Response Time	¡ 100ms (cached)
Dashboard Load	50ms (40x faster)
Real-Time Latency	¡ 50ms
Concurrent Users	1000+ simultaneous
Network Elements	100,000+ supported
Sensor Throughput	100,000+ readings/sec
AI Processing	5-10 sec per analysis
Uptime SLA	99.99%

7 Deployment Options

7.1 Flexible Infrastructure

1. Cloud SaaS (Recommended)

- AWS Asia-Pacific (Singapore)
- 99.99% uptime SLA
- Automatic scaling
- Zero-downtime updates
- 24/7 monitoring
- Lowest total cost of ownership

2. On-Premises (Government/Critical)

- Full data sovereignty
- Air-gapped deployment option
- Integration with existing IT infrastructure
- Installation support included

3. Hybrid (OT/IT Segregation)

- On-premises for SCADA/control systems
- Cloud for AI processing and analytics
- Secure encrypted synchronization
- Best of both worlds

7.2   Implementation Timeline

Phase	Activities
Week 1-2	Requirements gathering, system configuration, AWS setup, team onboarding
Week 3-4	Data migration, network model creation, SCADA integration setup
Week 5-6	User training, workflow customization, acceptance testing
Week 7-8	Go-live support, optimization, documentation handover
Week 9+	Full operations, ongoing support, feature enhancements

Typical Implementation: 6-8 weeks for single platform, 10-12 weeks for full suite

8   Investment & Pricing

8.1   SaaS Subscription Model

Platform 1: Water Compliance & Quality Management

Tier	Annual Fee	Includes
Starter	$30,000	5-25K connections, 10 users
Professional	$60,000	25-100K connections, 25 users
Enterprise	$120,000	Unlimited, unlimited users

Platform 2: Digital Twin for Water Infrastructure

Tier	Annual Fee	Includes
Starter	$36,000	5,000 network elements
Professional	$96,000	25,000 network elements
Enterprise	$240,000	Unlimited elements

Platform 3: Asset Intelligence & Risk Management

Tier	Annual Fee	Includes
Starter	$36,000	Up to 10,000 assets
Professional	$72,000	Up to 50,000 assets
Enterprise	$144,000	Unlimited assets

8.2   Bundle Pricing (All Three Platforms)

Integrated Suite Discount: 30% savings vs. separate purchases

Tier	Separate	Bundle	Savings
Starter	$102,000	$71,400	$30,600
Professional	$228,000	$159,600	$68,400
Enterprise	$504,000	$352,800	$151,200

8.3   Implementation & Services

Service	Cost
Platform configuration (per platform)	$15,000-30,000
Data migration	$10,000-25,000
SCADA integration	$20,000-50,000
CMMS/GIS integration	$15,000-35,000
Custom training	$3,000/day
On-site support	$2,500/day

8.4   ROI Analysis - Full Suite

Mid-Size Utility (100,000 connections, 25,000 network elements, 50,000 assets):

Cost Category	SGD (Annual)
Costs:	
Bundle subscription (Professional)	$159,600
Implementation (Year 1 only)	$100,000
Training	$15,000
Total Year 1 Cost	**$274,600**
Total Year 2+ Cost	**$159,600**
Benefits (Annual):	
Avoided failure costs	$2,500,000
Energy optimization	$750,000
Capital efficiency improvement	$2,000,000
Staff productivity gains	$500,000
Non-revenue water reduction	$400,000
Compliance cost avoidance	$300,000
Total Annual Benefits	**$6,450,000**
Year 1 Net Benefit	**$6,175,400**
Year 1 ROI	**22.5:1**
Payback Period	**2.1 weeks**
3-Year Net Benefit	**$19,045,200**

9   Singapore-Specific Use Cases

9.1   PUB - National Water Agency

Challenge: Manage Singapore's entire water network (5,600+ km pipes, 17 reservoirs, 4 NEWater plants, 5 desalination plants)

Solution - All Three Platforms:

- **Platform 1:** Monitor water quality across all treatment plants, automated PUB compliance reporting

- **Platform 2:** Digital twin of entire distribution network, optimize NEWater blending, energy cost reduction

- **Platform 3:** Predict pipe failures, risk-based capital planning for $2B+ infrastructure budget

Expected Benefits:

- $15-30M annual savings from energy optimization

- $20-50M avoided costs from prevented failures

- 2-3% reduction in non-revenue water = $8-12M/year

- 50% faster emergency response times

- Data-driven justification for infrastructure investments

9.2   NEWater & Desalination Facilities

Challenge: Ensure highest quality standards for indirect potable reuse, optimize energy-intensive operations
Solution:

- **Platform 1:** Real-time RO permeate quality monitoring, automated alerts for deviations

- **Platform 2:** Optimize blending ratios in distribution network, energy cost modeling

- **Platform 3:** Predict membrane fouling, optimize replacement schedules

Expected Benefits:

- 15-25% energy cost reduction

- 30% longer membrane life through predictive maintenance

- 99.99% compliance with drinking water standards

- Automated reporting for public transparency

9.3   Marina Barrage & Catchments

Challenge: Optimize reservoir operations, manage water quality, climate resilience
Solution:

- **Platform 1:** Real-time algal bloom monitoring, rainfall-runoff quality prediction

- **Platform 2:** Hydraulic simulation of tidal barrier operations, flood modeling

- **Platform 3:** Infrastructure asset health tracking, storm damage risk assessment

Expected Benefits:

- Proactive algal bloom management

- Climate change scenario planning (sea level rise)

- Optimized tidal barrier operations

- Public recreation water safety assurance

9.4   Jurong Island Industrial Complex

Challenge: Manage complex industrial wastewater and process water needs for 95+ petrochemical plants

Solution:

- **Platform 1:** Multi-site water quality monitoring, NEA discharge compliance
- **Platform 2:** Digital twin of industrial water network, emergency response planning
- **Platform 3:** Critical asset failure prediction, risk-based maintenance

Expected Benefits:

- Prevent costly production disruptions
- Automated NEA compliance reporting
- Water reuse optimization
- Emergency containment planning

9.5   Smart Nation Initiative

Challenge: Align water management with Singapore's Smart Nation vision

Solution:

- **Platform 1:** Public-facing water quality transparency portal
- **Platform 2:** Integration with 800,000+ smart water meters, citizen apps
- **Platform 3:** Predictive infrastructure planning for urban development

Expected Benefits:

- Real-time water quality information for citizens
- Smart meter data analytics for demand management
- Transparent infrastructure investment planning
- Research data sharing with universities

9.6   Research Institutions (NUS/NTU/SMART)

Challenge: Enable cutting-edge water research and innovation

Solution:

- **Platform 1:** Wastewater-based epidemiology data, AMR surveillance
- **Platform 2:** Network modeling for research scenarios, simulation sandbox
- **Platform 3:** Infrastructure data for resilience research

Expected Benefits:

- Unlimited historical data storage for long-term studies
- API access for research tools (R, Python)
- Collaborative research opportunities
- Joint publications and innovation

10   Competitive Advantages

10.1   Why Choose Our Platform Suite?

Advantage	Benefit
Integrated Suite	Only solution combining compliance + digital twin + asset intelligence
AI-Powered	Claude 3.5 Sonnet provides human-level insights
Modern Technology	Built with latest tech stack, 40x faster than legacy systems
Singapore-Ready	AWS Singapore hosting, PDPA compliant, PUB-aligned
Production-Proven	Already deployed and tested, not vaporware
Cost-Effective	50-70% lower cost than enterprise alternatives
Rapid Deployment	6-12 weeks vs. 6-12 months for legacy systems
API-First	Integrates with existing systems, no rip-and-replace
Research-Friendly	Unlimited data, full API access for universities
Climate-Resilient	Built-in scenario modeling for adaptation planning

10.2   Comparison with Alternatives

Feature	Our Suite	Legacy SCADA	Spreadsheets
AI Analysis	Yes	No	No
Real-Time Digital Twin	Yes	Limited	No
Predictive Analytics	Yes	No	No
Cloud-Based	Yes	No	N/A
Mobile Access	Yes	No	Limited
Integration APIs	Full	Limited	No
Setup Time	6-12 weeks	6-12 months	N/A
Cost (Annual)	$$	$$$$	$
Scalability	High	Low	Low

11   Pilot Program Proposal

11.1   6-Month Pilot Structure

Objective: Validate technology and ROI before full deployment

Phase 1 (Months 1-2): Platform Selection & Setup

- Select 2-3 facilities or network segments

- Choose 1-2 platforms based on priority pain points

- Deploy cloud infrastructure

- Initial training for 5-10 key users

Phase 2 (Months 3-4): Operations & Validation

- Daily operations with full support
- Track key metrics (energy savings, response times, etc.)
- Collect user feedback for optimization
- Document quick wins and challenges

Phase 3 (Months 5-6): Analysis & Expansion Planning

- Generate comprehensive ROI report
- Conduct executive presentation
- Develop full deployment roadmap
- Negotiate enterprise contract terms

11.2   Pilot Pricing

Special Pilot Offer - 50% Discount:

- Single platform: $15,000-36,000 for 6 months
- Two platforms: $40,000-80,000 for 6 months
- Full suite: $75,000-120,000 for 6 months
- Implementation included (normally $50K-100K)
- White-glove support throughout pilot
- No long-term commitment required

Pilot Success Criteria:

- Documented cost savings or operational improvements
- User satisfaction score ¿ 4.0/5.0
- System uptime ¿ 99.5%
- Successful integration with existing systems
- Clear ROI path demonstrated

12   Next Steps

12.1   Proposed Actions

1. **Live Demonstration (90 minutes)**

   - Interactive walkthrough of all three platforms
   - Singapore-specific use cases and examples
   - Q&A with technical team
   - Optional: Demo with your actual data

2. **Site Visit & Assessment**

   - Visit selected facility to understand needs
   - Meet with operations, engineering, and IT teams
   - Review existing systems and integration points

- Develop customized implementation plan

3. **Pilot Program Design**

- Define pilot scope and success metrics
- Select platforms based on priority pain points
- Establish timeline and resource requirements
- Negotiate pilot terms and pricing

4. **Technical Integration Planning**

- SCADA/CMMS/GIS integration assessment
- Data migration strategy
- Security and compliance review
- Infrastructure requirements (cloud vs. on-premise)

5. **Executive Presentation**

- ROI analysis and business case
- Comparison with alternatives
- Risk assessment and mitigation
- Implementation roadmap

12.2 Timeline to Pilot Launch

Week	Milestone
Week 1-2	Initial meetings, live demo, site assessment
Week 3-4	Pilot proposal, technical integration planning
Week 5-6	Contract negotiation, purchase order
Week 7-8	Cloud infrastructure setup, team onboarding
Week 9-10	Pilot launch, initial training

Timeline to pilot operations: 8-10 weeks from initial contact

12.3 Contact Information

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Transform Singapore's Water Management

We're ready to demonstrate how our integrated platform suite
can deliver measurable value to your organization