AUSTRALIAN WATER REFORM ROADSHOW

TRANCHE 3 STORMWATER, ENGAGEMENT
THE FUTURE OF WATER

MODULE 1 FUTURE OF WATER

Speakers

Adam Lovell

Executive Director
Water Service
Association of Australia
(WSAA)

Dona Tantirimudalige

Managing Director
Westernport Water

Kevin Hutchings

Director at Valid
& Water Sector Advisor
at SPICAE

Richard Simpson

Executive Director
at Meta Moto

spicae

The future of urban water services in Australia & New Zealand

Adam Lovell

Executive Director Water Service Association of Australia (WSAA)

WATER SERVICES ASSOCIATION OF AUSTRALIA

WSAA Utility Members

Private Utility	Suez, Trility, Veolia
Consultant	Aecom, Arup, Aurecon, GHD, Jacobs, KPMG
Stakeholder	Dept Health/ Human Services, NSW DPI, NSW Directorate, QLD Directorate, VIC Water

NT
Power and Water Corporation

QLD
Queensland Urban Utilities
City of Gold Coast
Gladstone Area Board
Gladstone Regional Council
Logan City Council
Redland City Council
Seqwater
SunWater
City of Townsville
Toowoomba Regional Council
Unitywater
Banana Regional Council
Isaac Regional Council
Ipswich Council
Mackay Regional Council
Mount Isa Water Board
Southern Downs Regional Council
Wide Bay Water
Cairns Water
Western Downs Regional Council
Whitsunday Regional Council

NSW
Central Coast Council
Goldenfields Water
Hunter Water
Shoalhaven Water
Sydney Water
WaterNSW
Queanbeyan Regional Council
Centroc (11 Councils)
ORANA (11 Councils)
Rous County Council
Byron Shire Council
Eurobodalla Shire Council
Lismore City Council
MidCoast Water
Port Maquarie-Hastings Council
Tweed Shire Council
Dubbo City Council
Kempsey Shire Council
Riverina Water

WA
Water Corporation
Aqwest
Busselton Water
Kalgoorlie-Boulder

SA
SA Water

ACT
Iconwater

NZ
Watercare Services
Wellington Water

VIC
Barwon Water
Central Highlands Water
City West Water
Coliban Water
Gippsland Water
Goulburn Valley Water
Melbourne Water
South East Water
Western Water
Yarra Valley Water
Westernport Water
East Gippsland Water
Goulburn Murray Water
GWM Water
North East Water
Wannon Water
Lower Murray Water
South Gippsland Water
Southern Rural Water

TAS
Taswater

Urban water industry drivers

Beyond COVID-19, there are four key drivers that underpin the industry outcomes, industry enablers and WSAA priorities in the WSAA Strategy 2021-23

CLIMATE CHANGE

- Intergovernmental Panel on Climate Change (IPCC) concludes that climate change is widespread, rapid, and intensifying.
- 14 Australian water utilities recently joined the Race To Zero

CUSTOMER & COMMUNITY EXPECTATIONS

- Expectations continue to change and grow, reflecting broader community shifts.
- 2021 National Customer Perceptions Survey found significant increases in customer trust and value.
- Challenges remain in maintaining affordability and supporting customers in difficulty.

MACRO INDUSTRY TRENDS

- Falling interest rates, operating and capital costs are rising.
- Adapting to climate change will likely incur increased expenditure
- Whole sector needs to evolve approaches to be prepared.

CIRCULAR ECONOMY

- Water utilities play an important role as resource stewards
- Position as resource recovery enterprises – focusing on the whole interconnected system of water, energy including hydrogen, nutrient and mineral flows.

WSAA STRATEGY 2021–23

INDUSTRY OUTCOMES

- Meet and exceed customer expectations, maintain affordability and support customers in difficulty
- Accelerate the industry transition to net zero in response to climate change
- Water sector resilience, including through diversity of supply
- Lead water's contribution to thriving communities
- Embed water's role in the circular economy

WSAA PRIORITIES

- National advocacy supporting industry outcomes
- Understanding drivers of customer trust and value
- Driving progress on the Sustainable Development Goals including a focus on uplift of regional, remote and Indigenous water services
- Promoting health, liveability and wellbeing
- Fostering the transition to a low carbon future and circular economy
- Performance improvement initiatives

INDUSTRY ENABLERS

- Leadership, capability and culture
- Diversity and inclusion
- Health, safety and wellbeing
- Sharing and lifting performance
- Deep knowledge through data and actionable insights
- Stakeholder engagement and partnerships
- Driving an industry innovation ecosystem

WATER SERVICES ASSOCIATION OF AUSTRALIA

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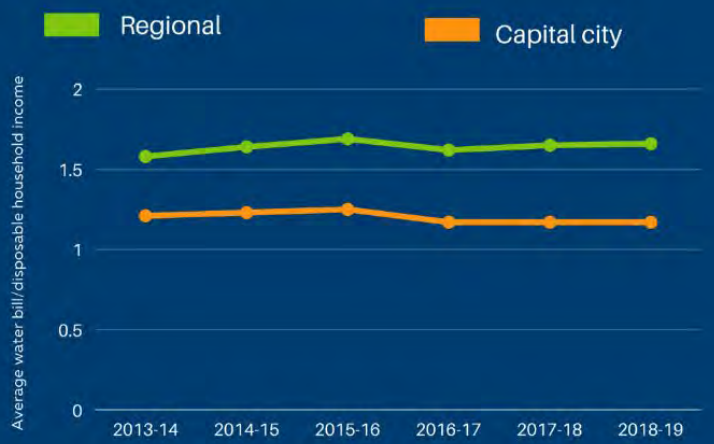
INDUSTRY OUTCOME

Meet and exceed customer expectations, maintain affordability and support customers in difficulty

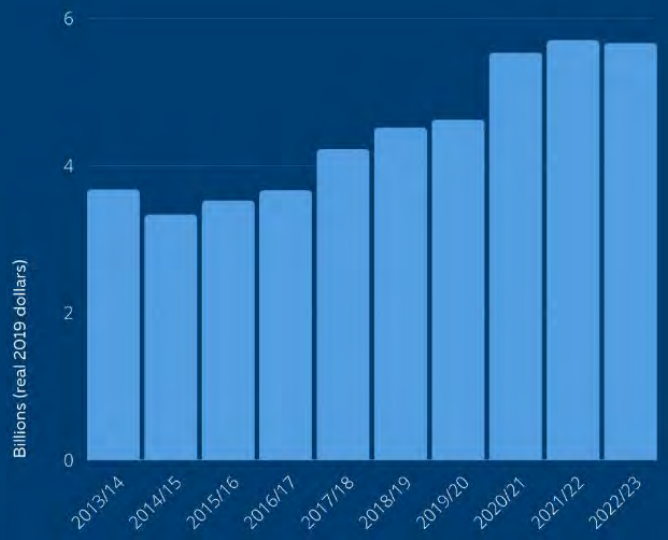
Water is affordable

Average bills as a proportion of household income

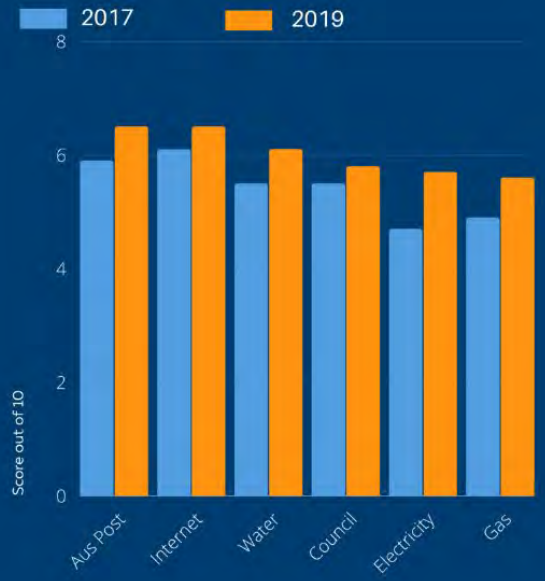


Capital expenditure is growing

17 large utilities over 10 years



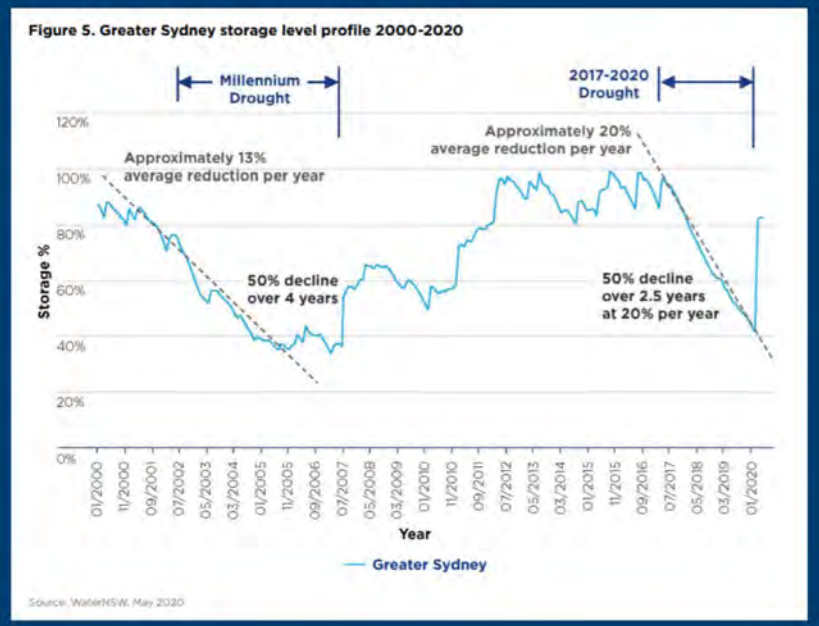
Value for money



Water sector resilience, including through diversity of supply

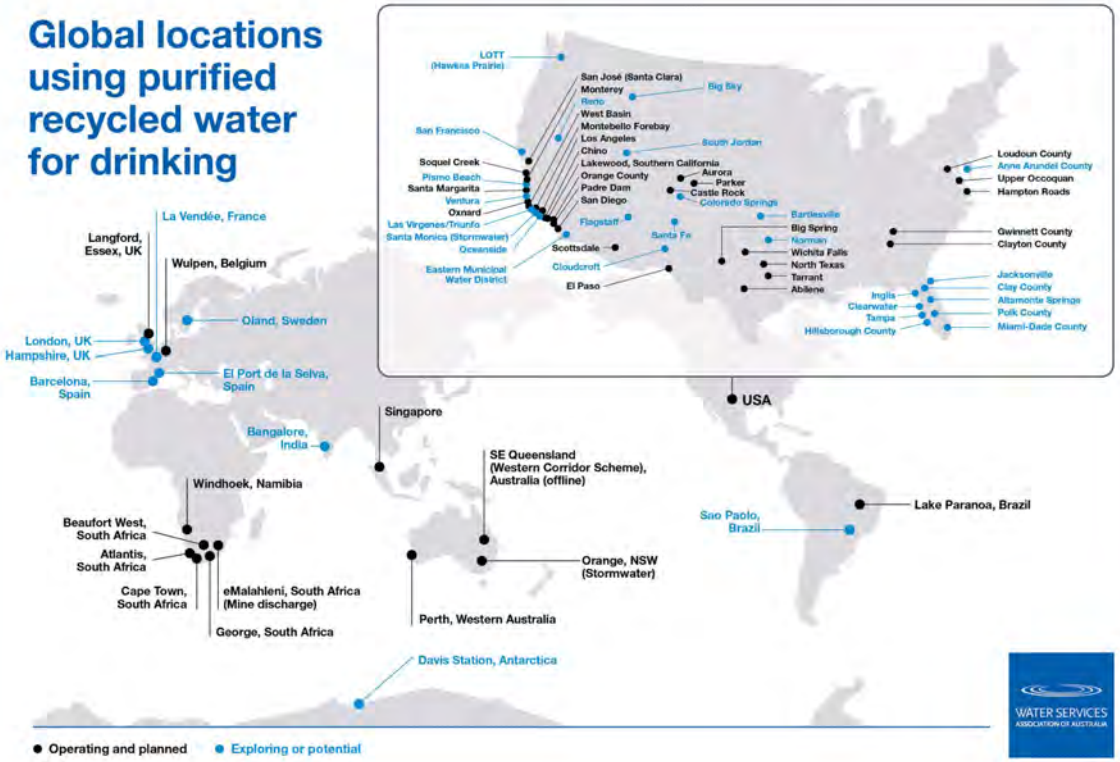
INDUSTRY OUTCOME

Figure 5. Greater Sydney storage level profile 2000-2020



Source: WaterNSW, May 2020

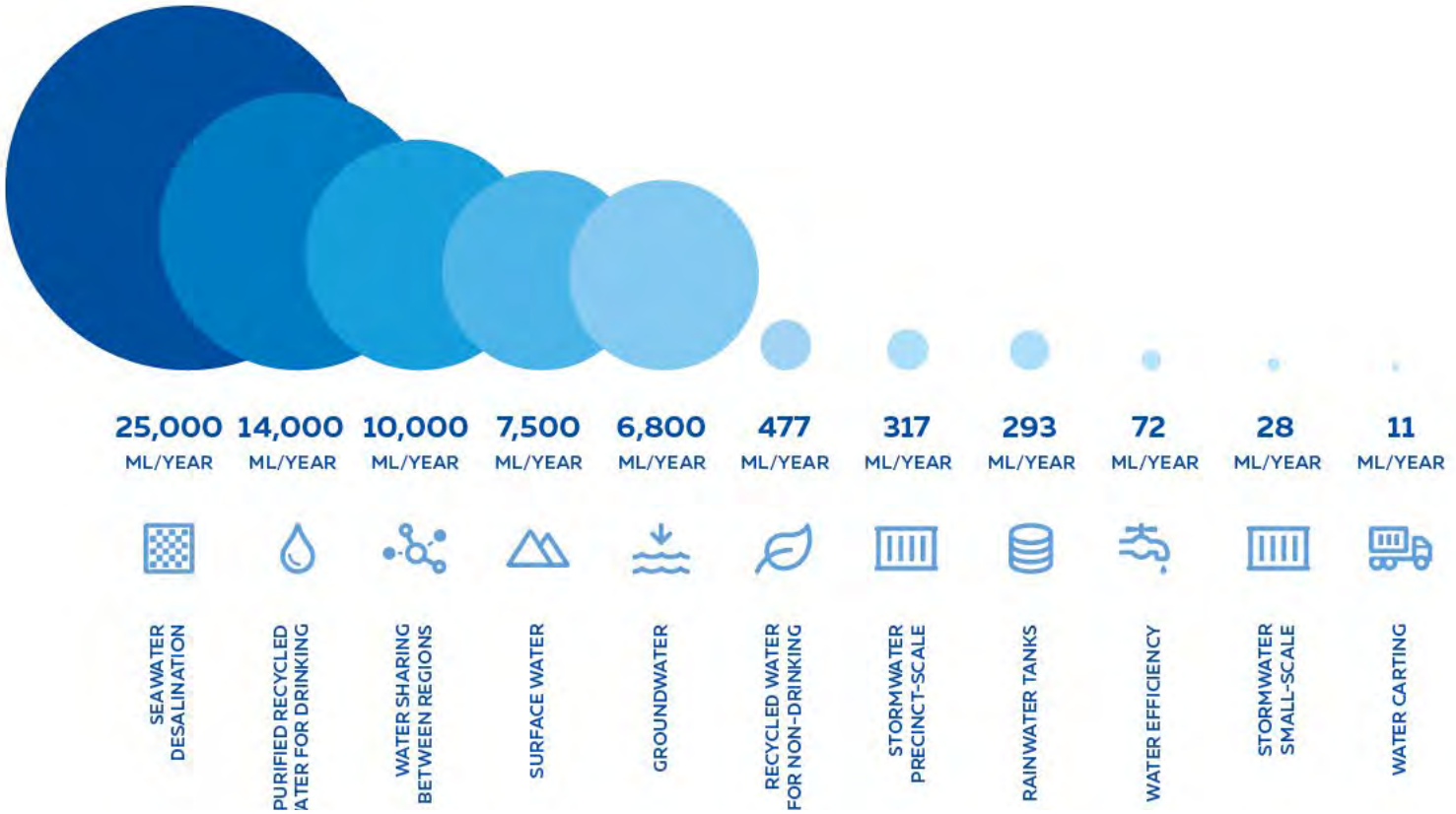
Global locations using purified recycled water for drinking



How much water do these options supply?

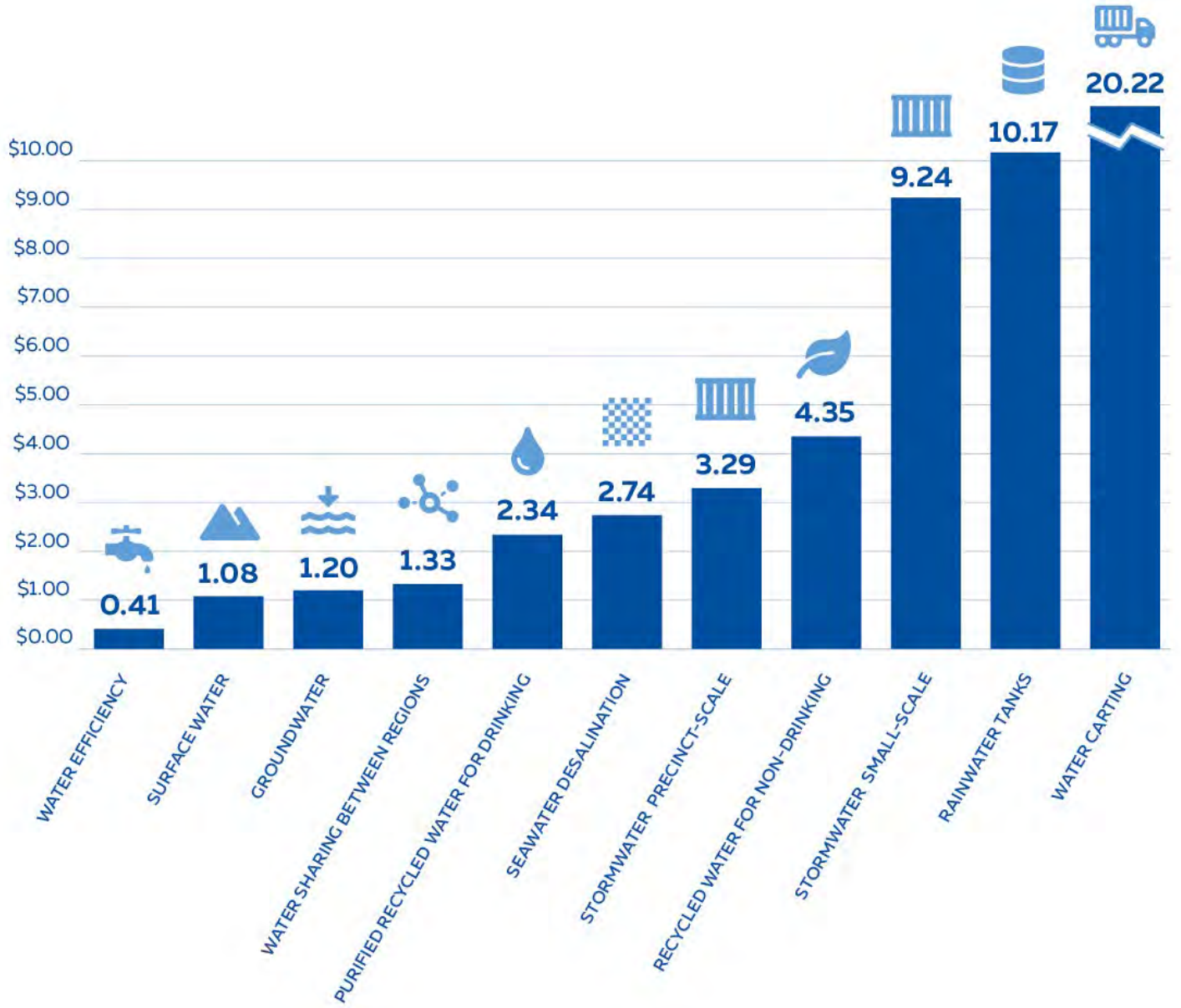
Median yield of water supply options included

ML/YEAR = MILLION LITRES PER YEAR



Costs of water supply options included in WSAA study

LEVELISED $/KL 2019–20

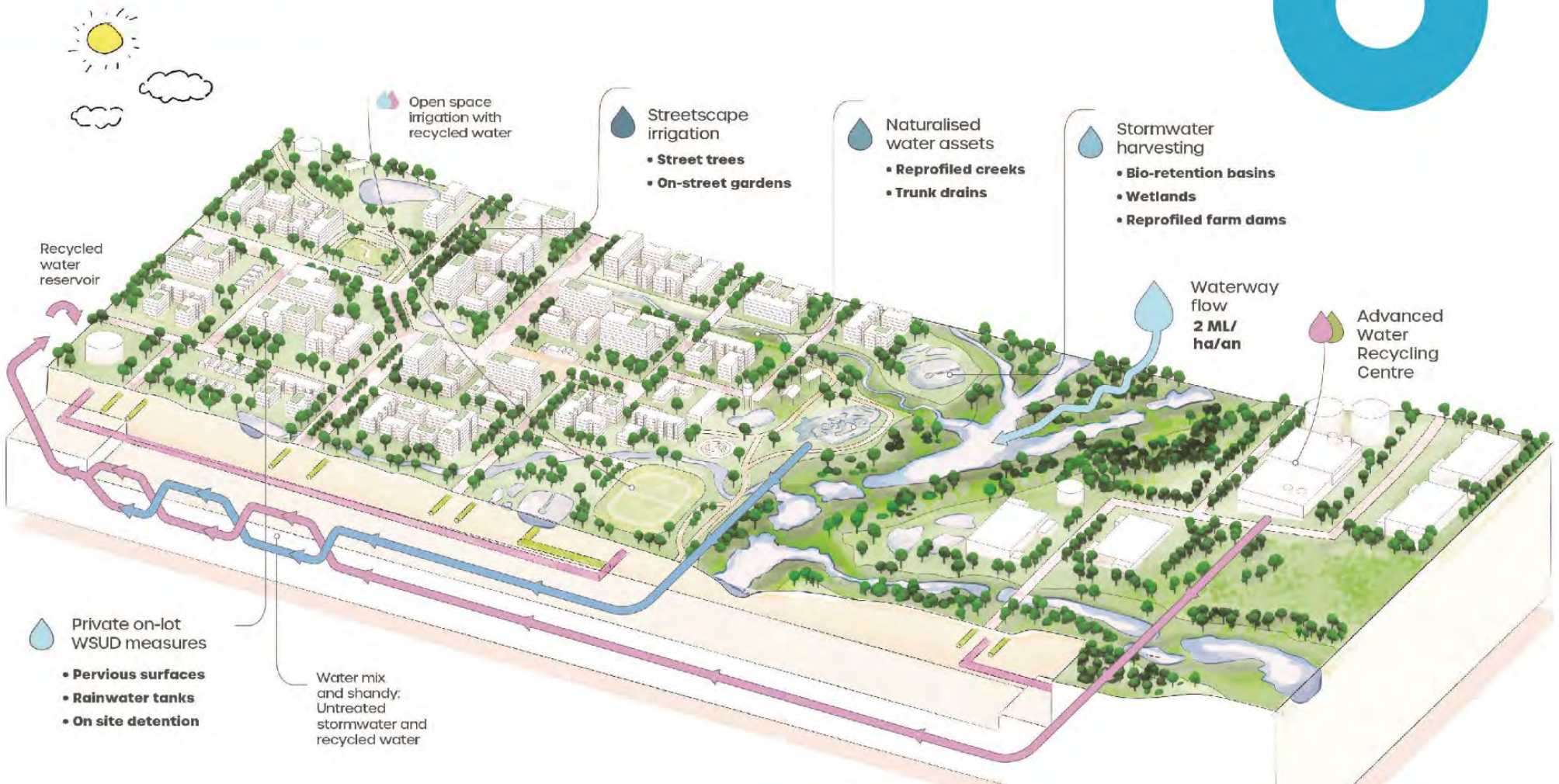


INDUSTRY OUTCOME

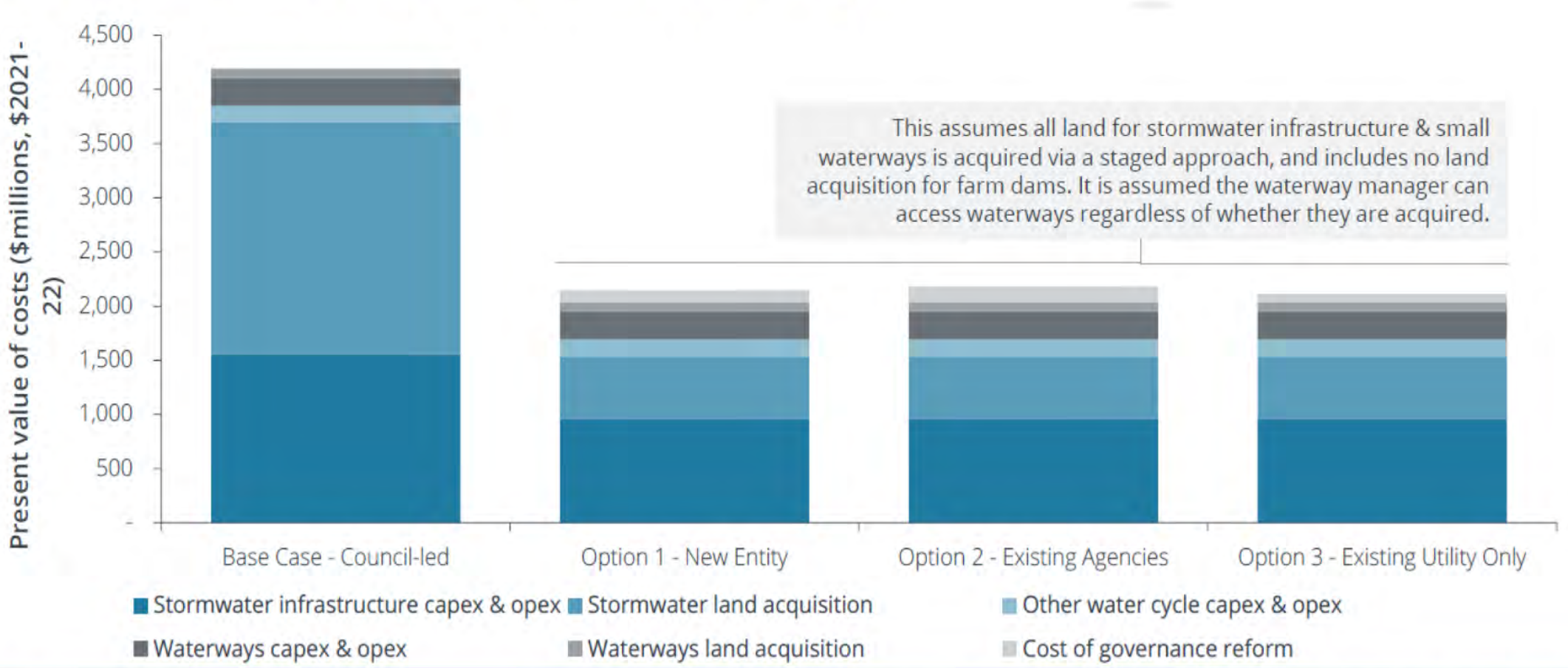
Lead water's contribution to thriving communities

Integrated Water Cycle Management

Western Sydney Parkland City



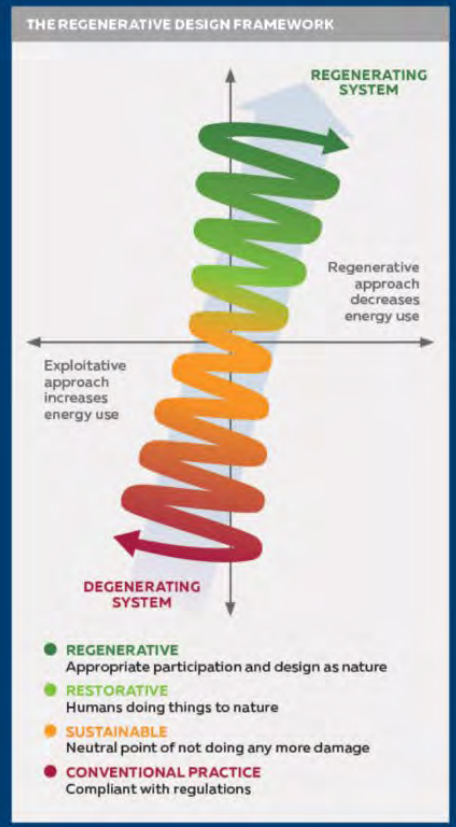
Total Infrastructure Cost Savings



Total infrastructure cost savings from catchment wide approach are over $2B (PV terms (7%)) or $4.3B (non-discounted terms), primarily from reduced land acquisition and infrastructure requirements

Embed water's role in the circular economy

INDUSTRY OUTCOME



Energy Production

- Hydrogen
- Biochar to energy
- Energy efficiency, renewables, energy exchange

Water Cycle

- Purified recycled water
- Blue + Green Infrastructure
- Fit for purpose recycling

Materials

- Biorefinery
- Nutrient recovery
- Waste to resource

Industry Enablers

- Leadership, capability and culture
- Diversity and inclusion
- Health, safety and wellbeing
- Deep knowledge through data and actionable insights
- Sharing and lifting performance
- Stakeholder engagement and partnerships
- Driving an industry innovation ecosystem

WSAA Priorities

- National advocacy supporting industry outcomes
- Understanding drivers of customer trust and value
- Driving progress on the Sustainable Development Goals including a focus on uplift of regional, remote and Indigenous water services
- Promoting health, liveability and wellbeing
- Fostering the transition to a low carbon future and
- circular economy
- Performance improvement initiatives

Climate change, innovation, & working together

Dona Tantirimudalige

Managing Director
Westernport Water

Westernport Water

Connected, Engaged, Empowered Community

The challenge

- Climate change impacts, reducing stream flows, affordability

The opportunity

- Innovation, partnerships, and the circular economy
  - Sustainable Water Strategy – collective strategic plan
  - Local example – Westernport Water Gap Road precinct
  - Better together

The Challenge & the Opportunity

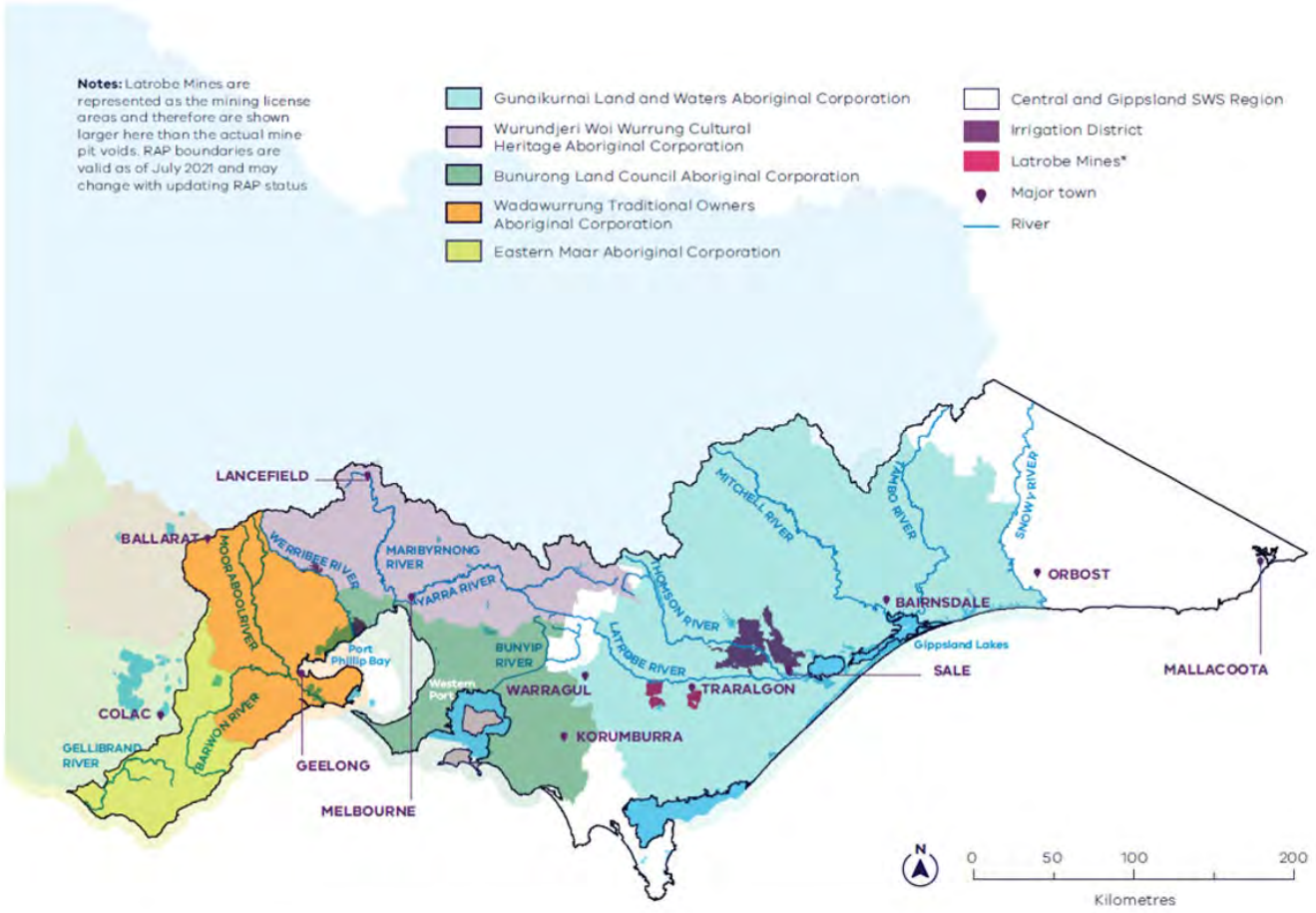


Figure 1-1: The Central and Gippsland SWS Region and major waterways covered by this Strategy and the Registered Aboriginal Parties (RAPs) in the region. The RAP boundaries are current at 30 June 2021, and will be updated to reflect changes to RAP boundaries in effect from 1 July 2021

Sustainable Water Strategy for Central & Gippsland Region

Collective strategic planning

The Challenge & the Opportunity

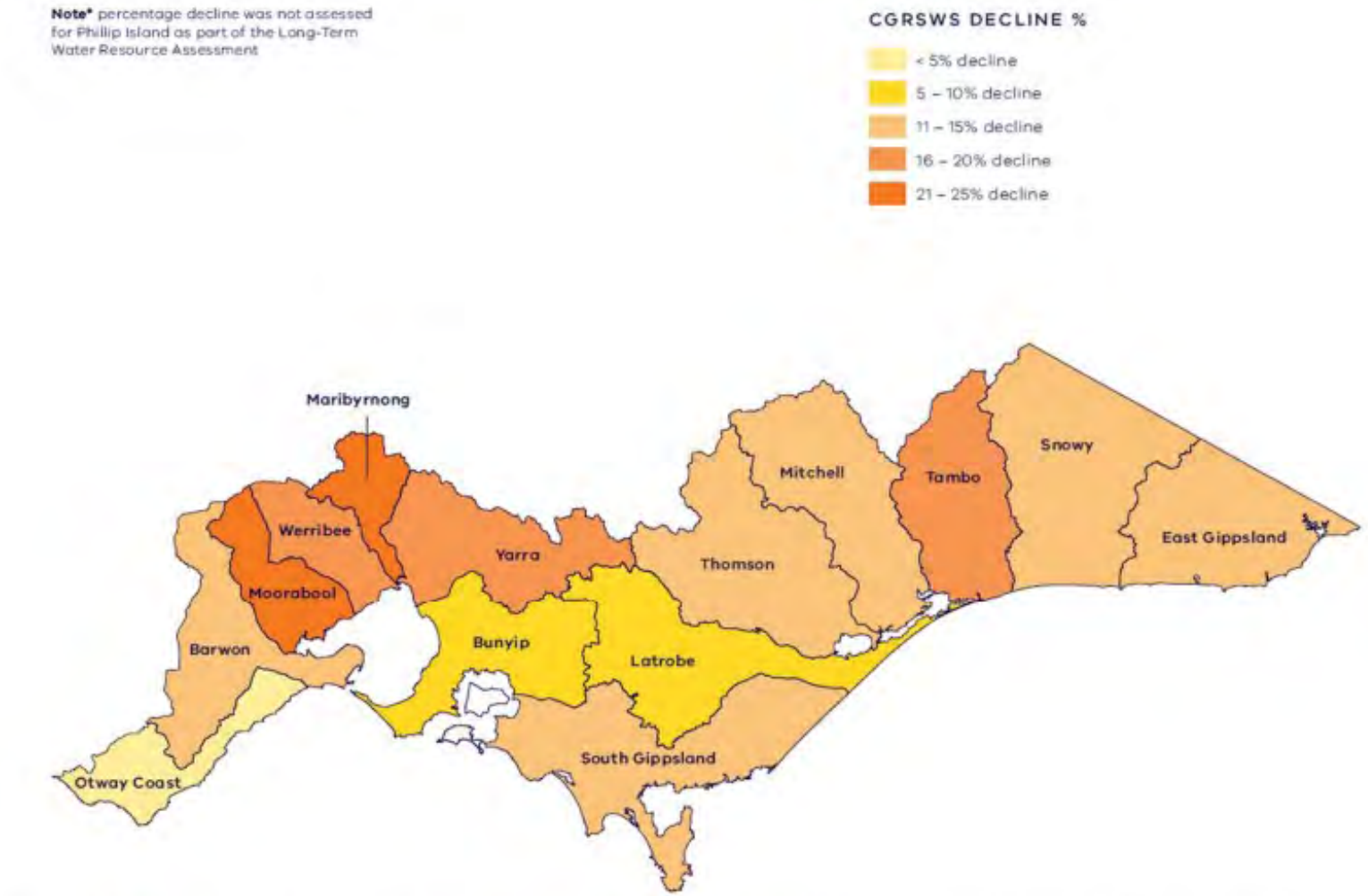


Figure 2-5: Percentage decline in surface water availability in each basin across southern Victoria for 1975–2020, relative to the long-term record — page 34 of the CGRSWS discussion draft.

Source: www.water.vic.gov.au/__data/assets/pdf_file/0032/544847/Central-and-Gippsland-SWS-consultation-draft-v2.pdf

The Challenge & the Opportunity

Projected populations

Figure in the CGRSWS Discussion Draft

This section provides technical information related to Figure 3-4 in the CGRSWS Discussion Draft that describes past and projected populations of major Victorian regions, 2016 to 2056 Central and Gippsland Region. This figure is reproduced in this report for ease of reference.

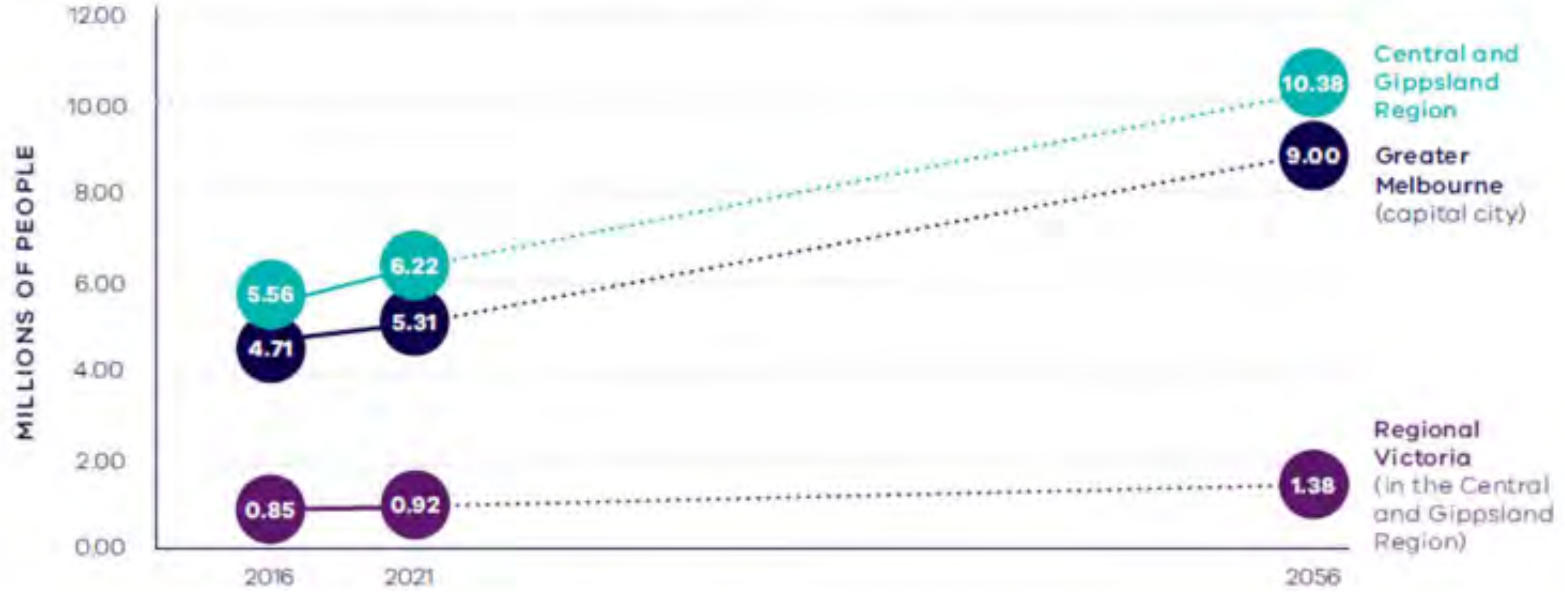


Figure 3-4: Past and projected populations of major Victorian regions, 2016-2056 - page 49 in the CGRSWS discussion draft.

Source: www.water.vic.gov.au/__data/assets/pdf_file/0032/544847/Central-and-Gippsland-SWS-consultation-draft-v2.pdf

The Challenge & the Opportunity

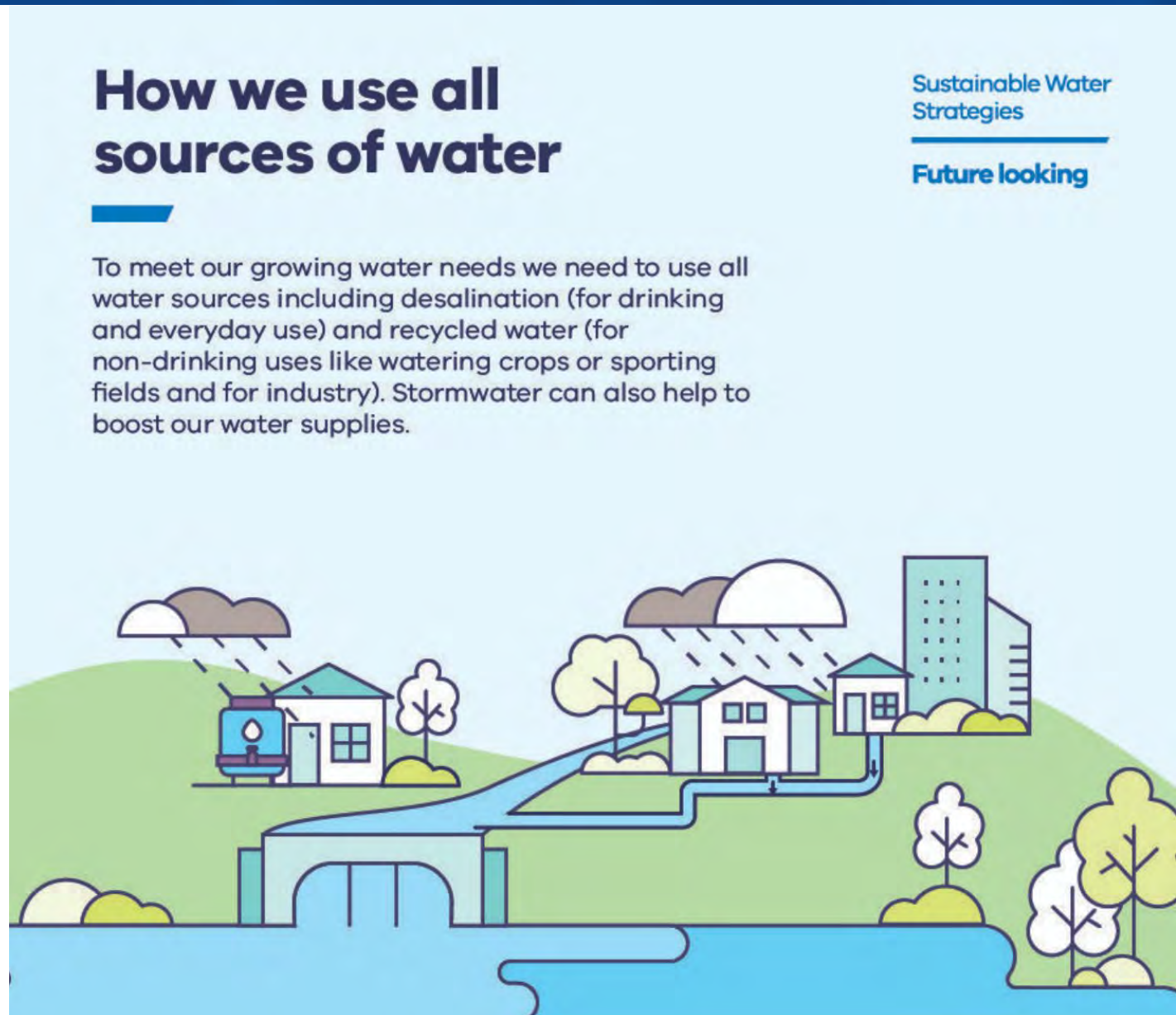
Table 10: Expected transition from reliance on river water to more manufactured water for Greater Melbourne.

Year	Surface Water (GL)	Desalination (GL)	Recycled water (GL)	Future water sources (manufactured water) (GL)	Total (GL)
2010	349	0	55	0	**404**
2020	324	125	48	0	**497**
2040	280	150	48	165	**643**
2065	201	150	48	472	**871**

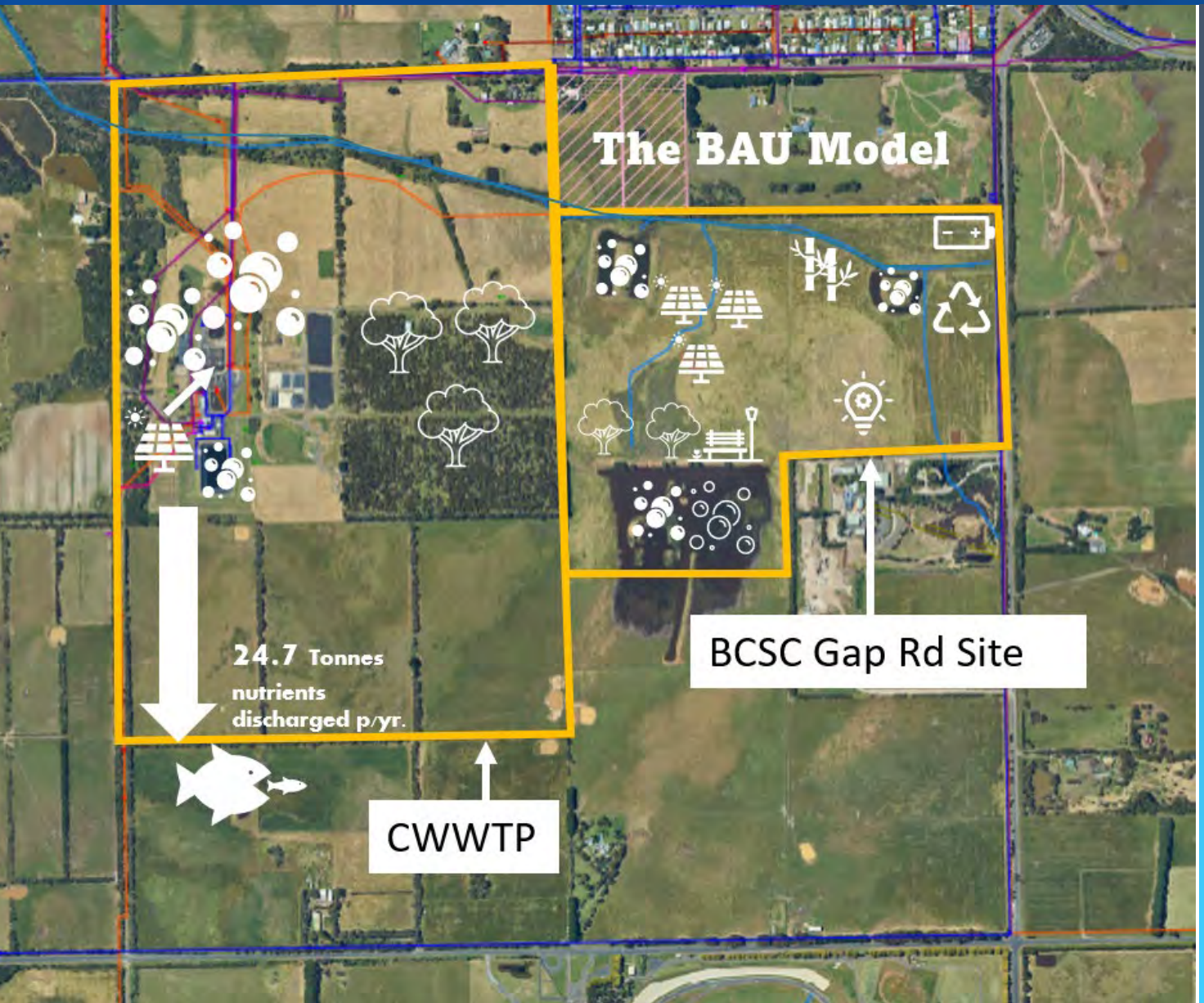
Source: www.water.vic.gov.au/__data/assets/pdf_file/0032/544847/Central-and-Gippsland-SWS-consultation-draft-v2.pdf

Using All Water Resources

- River flows and the role of manufactured water – desal, recycled water, stormwater
- Water efficiency is only one part of the solution
- The importance of bipartisan support
- The importance of partnerships.



Innovation, Partnerships, Holistic Solutions



Westernport Water Gap Road Precinct

Innovation, partnerships, holistic solutions

WESTERNPORT WATER

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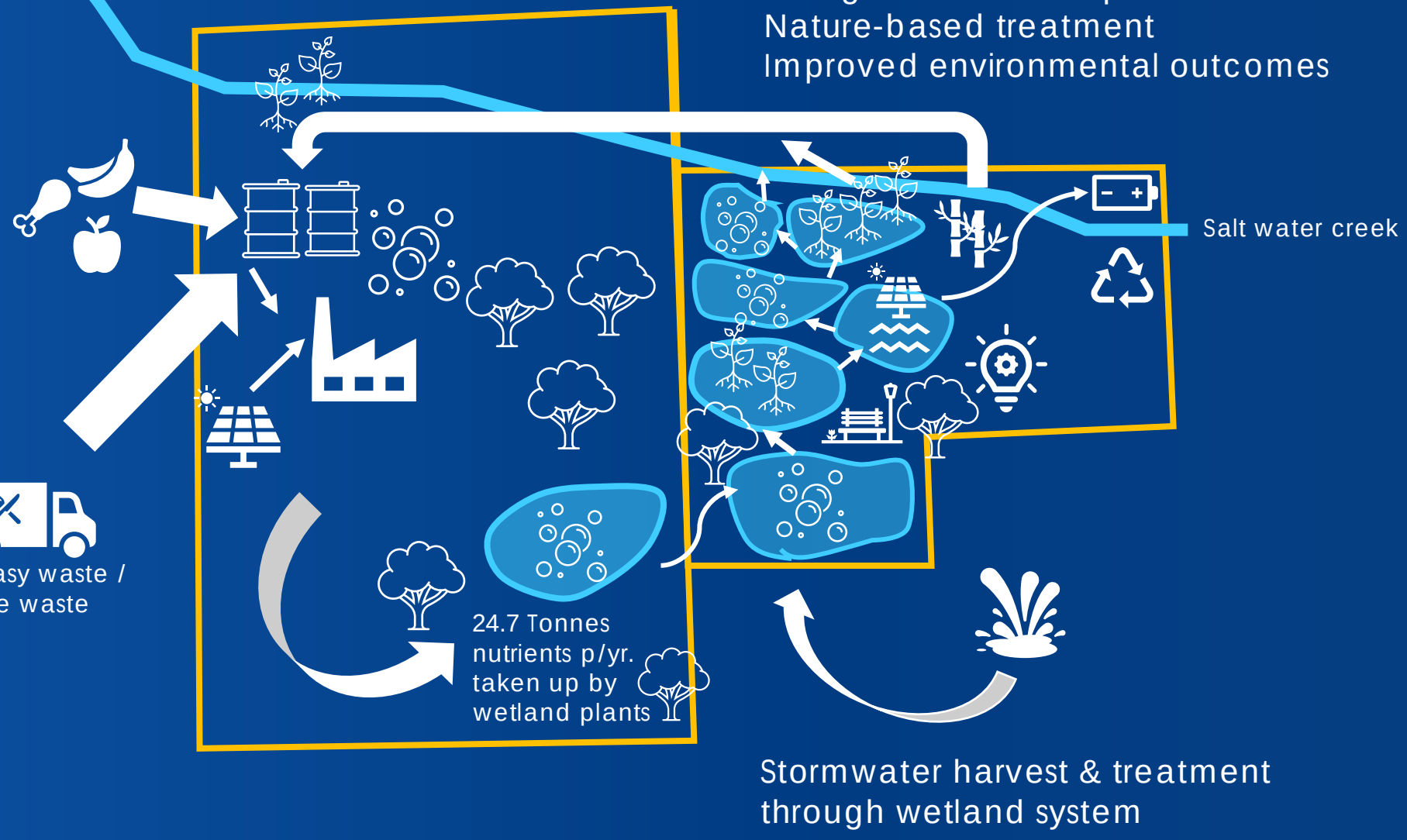
Circular model - waste to resource
Biological carbon sequestration
Nature-based treatment
Improved environmental outcomes



- Net source of CO2-e emission
- Net sink of CO2-e emission
- Nutrient uptake wetland plants
- Green waste transfer station
- Bio-gas plant
- Wastewater treatment plant
- Battery
- Resource recovery centre
- Education hub
- Recreational opportunities

Better Together

- Water industry wide partnerships
  - Zero Emissions Water
  - Gippsland Regional Water Alliance
- Local government partnerships
  - Renewable Organics Network
- Partnerships
  - Australian Gas Infrastructure Group
- Civil society partnerships
  - Community Owned Renewable Energy
- Role of peak bodies
- Traditional Owners
- Holistic win-wins

Regional renewable Organics Network

Hydrogen Park Murray Valley

The Future of Water

Innovation, Partnerships and Working Together

"Innovation is the ability to see change as an opportunity - not a threat."
Steve Jobs

spicae

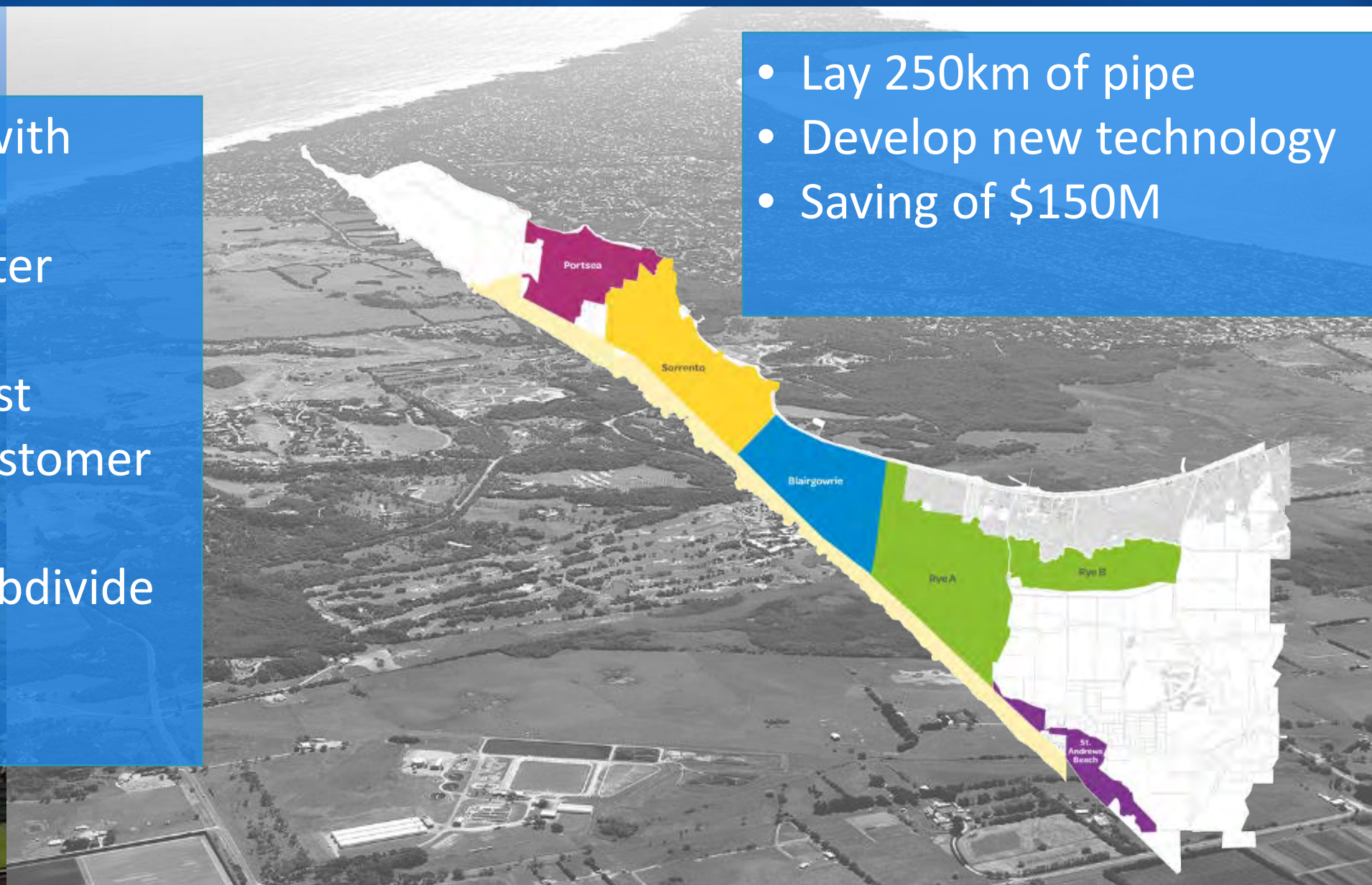
Innovation is the Future

Kevin Hutchings

Director at Valid
& Water Sector Advisor at SPICAE

Peninsula ECO Backlog

- 16000 properties with failing septics
- E-coli in groundwater
- 20 year project
- $500M forecast cost
- Can only charge customer $500.
- No extension or subdivide



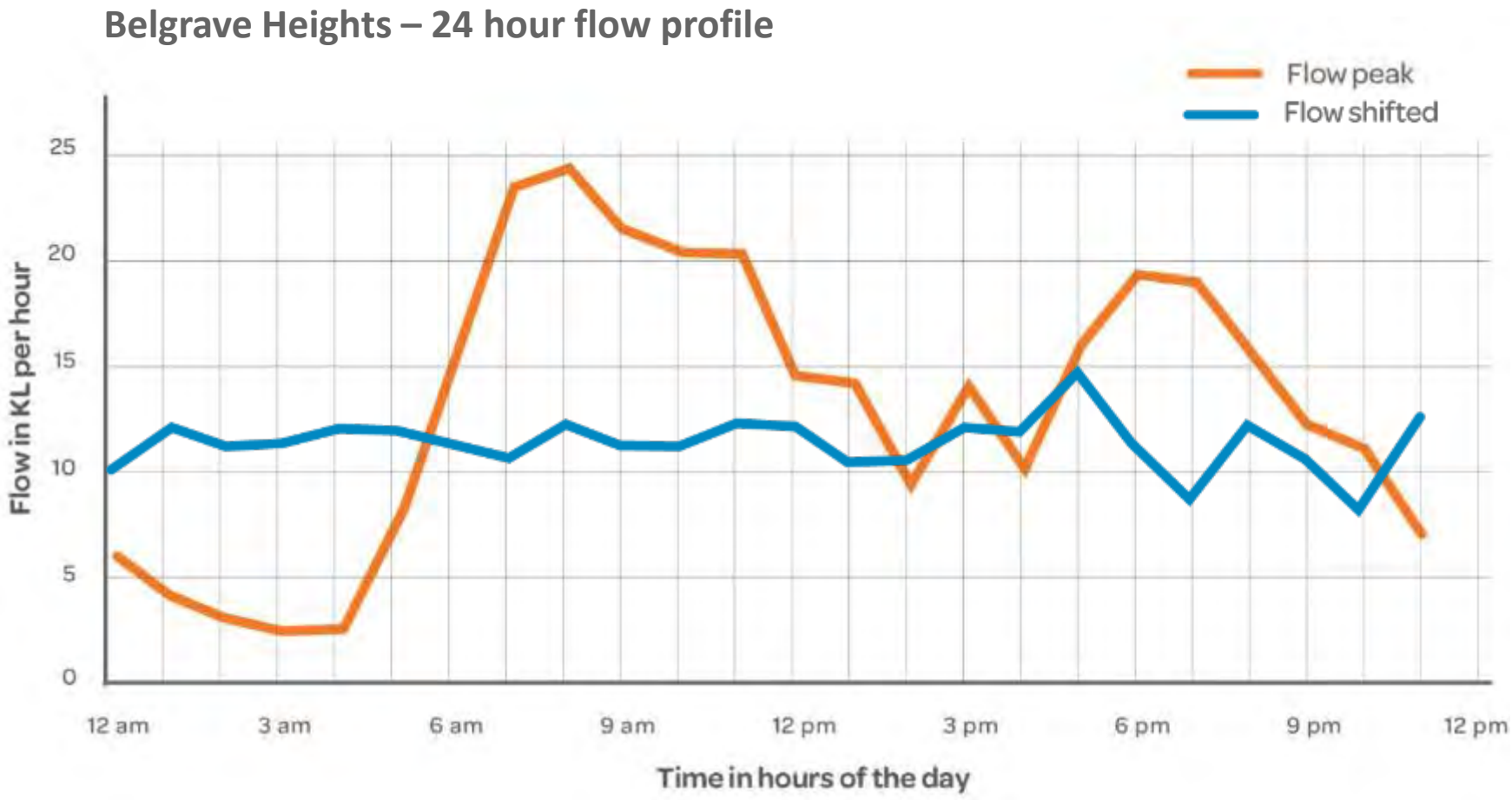
- Lay 250km of pipe
- Develop new technology
- Saving of $150M

Connecting a pressure sewer

- Directional Drilling
- Small Bore Pipe 63mm
- No Access Chambers
- Reductions of pump station
- Optional to participate
- A$6K avg. contribution
- House prices rise in value
- Needed to get regulatory approval
- Completed in 18 Months
- Control flows

“Sweating the asset”

- **Peak flow smoothing** – decrease peaks in the network
- **Flushing mode** – maintain flushing velocity in network
- **Storm mode** – ideal for gravity and pressure sewer combined catchments



Three Waters - Aquarevo

Prove a better way to use water at home – without losing the health/ liveability that water provides.

- Near real-time monitoring/visibility of all water use
- Showcase possibilities of harnessing all sources of water available to us
- Reduce network sizing and upfront investment
- Optimise local treatment, recycling and discharge
- Challenge regulation, compliance and monitoring
- Provide opportunity for further innovation within the water cycle
- Support other government water initiatives that seek to reduce reliance on drinking water

Aquarevo

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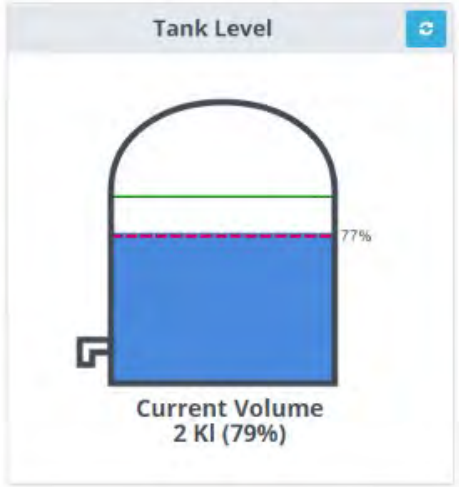
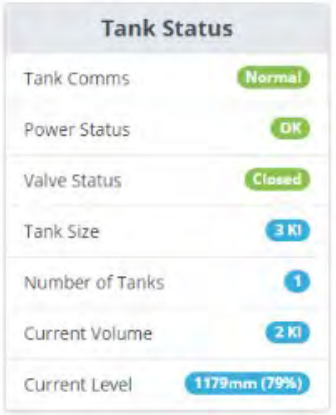
Incoming Flows





Show manual controls

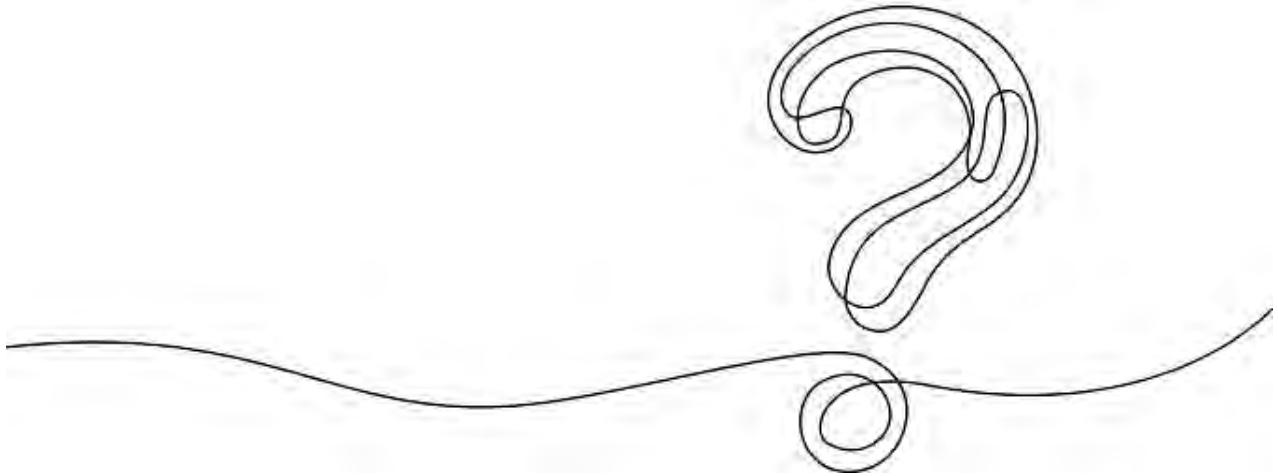
Aquarevo’s 450 homes use around 70 per cent less water than homes without access to rain and recycled water, with help from TankTalk® and OneBox®.


AQUARE
LAND
SALES

The key innovations that will be featured in each Aquarevo home include:

- Rain-to-hot water system (including 2,400-litre water tank) where rainwater is captured from the roof and stored in the tank. The rainwater undergoes screening, filtration, UV and heat treatment before supplying hot water taps in the shower, bath and laundry trough.
- TankTalk®, another important feature of the rainwater system. This solution helps the tank find out the weather forecast data, and then based on current tank levels and the likelihood of rain, the tank will release rainwater to before the rain comes, to help reduce stormwater flooding.
- OneBox® technology system, an IoT-enabled device which monitors and controls the pressure sewer network, and to smooth out peak flows when needed. It also allows customers to track their daily water and energy usage through our customer portal and controls Tank Talk®.
- An local treatment plant, which supplies the development with Class A recycled water, suitable for washing machines, toilets and outdoor use;
- Intelligent pressure sewer system which will eventually help South East Water send wastewater to a Water Recycling Plant within the estate. The wastewater will be treated and then sent back to homes as Class A recycled water for use on the garden, in the toilet and for washing clothes or to irrigate the trees lining the streets of Aquarevo.
- Generation of over 1000 MWh of renewable energy each year from solar panels installed as standard on all homes within the community;
- Future proofing of each home through provision of a 5KW sonnen battery supplied to all new purchasers and
- Electric vehicle charging points that could further improve the energy efficiency of homes as the green energy evolution continues.
- Beyond the initiatives within each home, Aquarevo will have expansive wetlands bordered by lush native flora to attract local wildlife, providing both environmental benefit and a visual reminder of its vision for a liveable, sustainable community. Each home within strolling distance of open parklands, along with an extensive network of walking and cycling tracks to encourage a healthy, active lifestyle.

Digital Water Meters



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Meta-Utility as a strategic transformational vehicle

Richard Simpson

Executive Director
at Meta Moto

Meta Moto
Navigating the Future

Meta Moto
Navigating the Future

spicae

The next revolution in the built environment is Digital not Physical

Meta Moto
Navigating the Future

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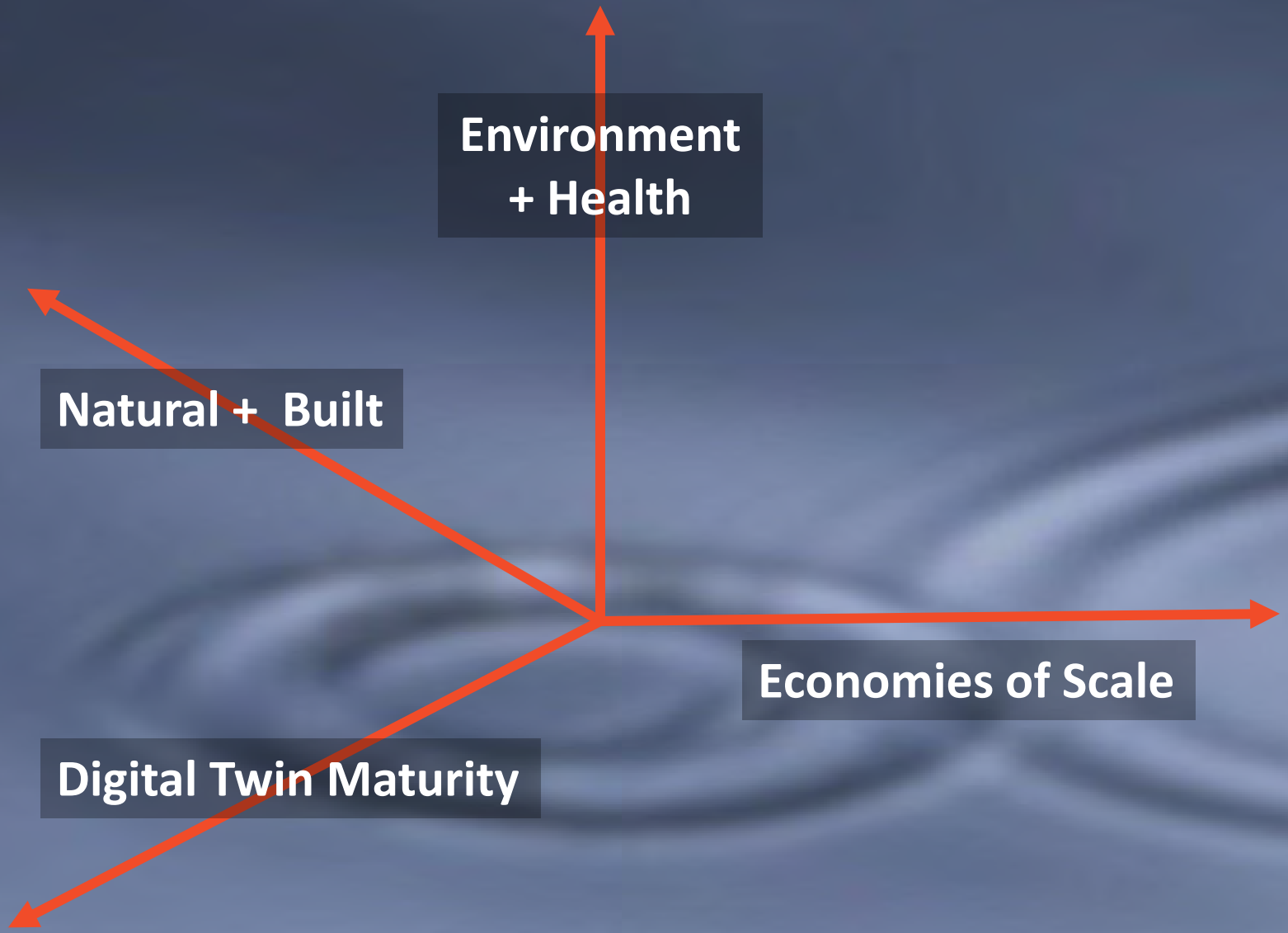
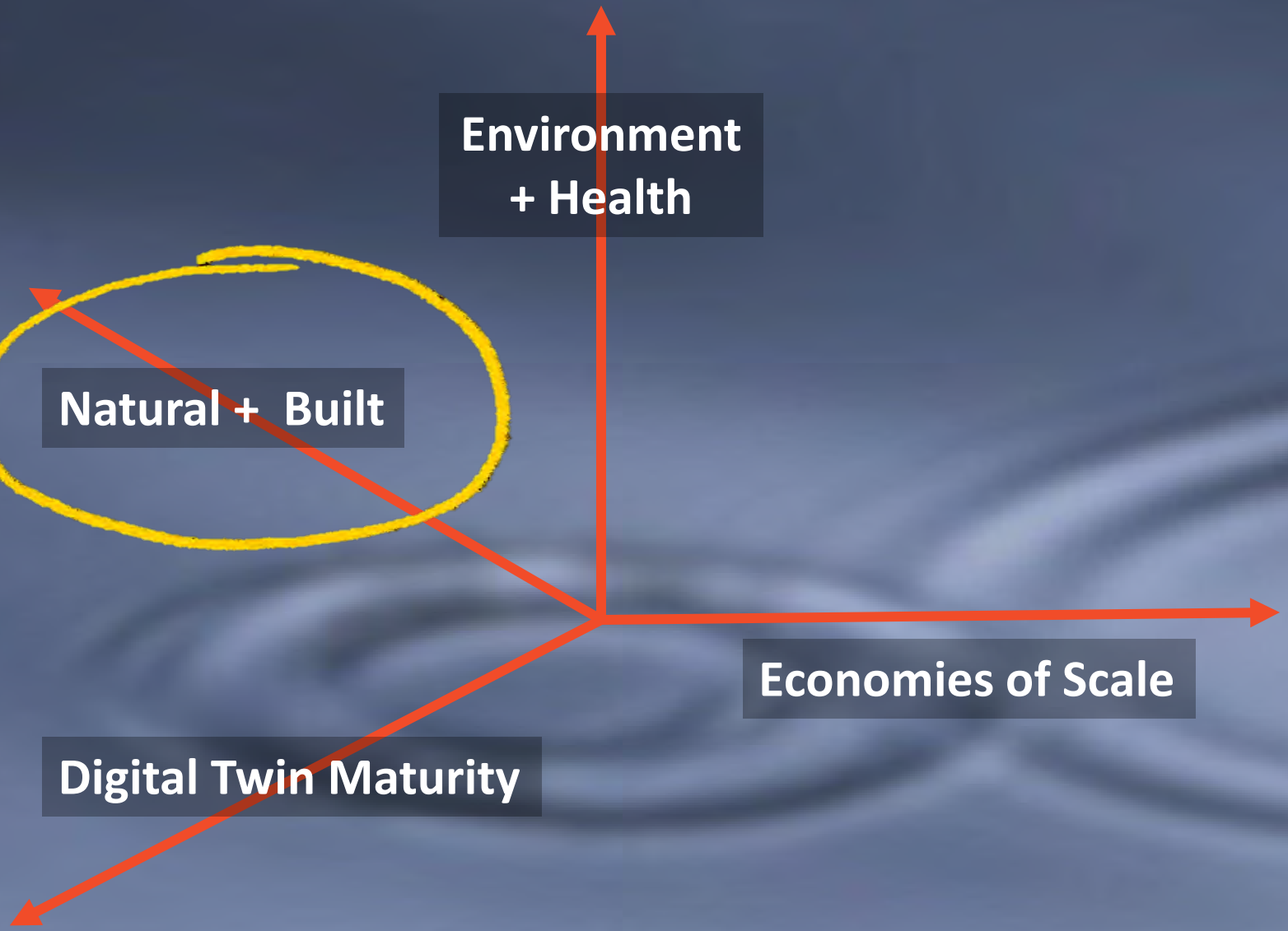
Meta Moto
Navigating the Future

We work with Governments, Utilities, Infrastructure, Telecommunications, Corporations, and Investor organisations to advise them on making better decisions, converting those decisions to actions and achieving more resilient outcomes through innovation, spatial information and technology.

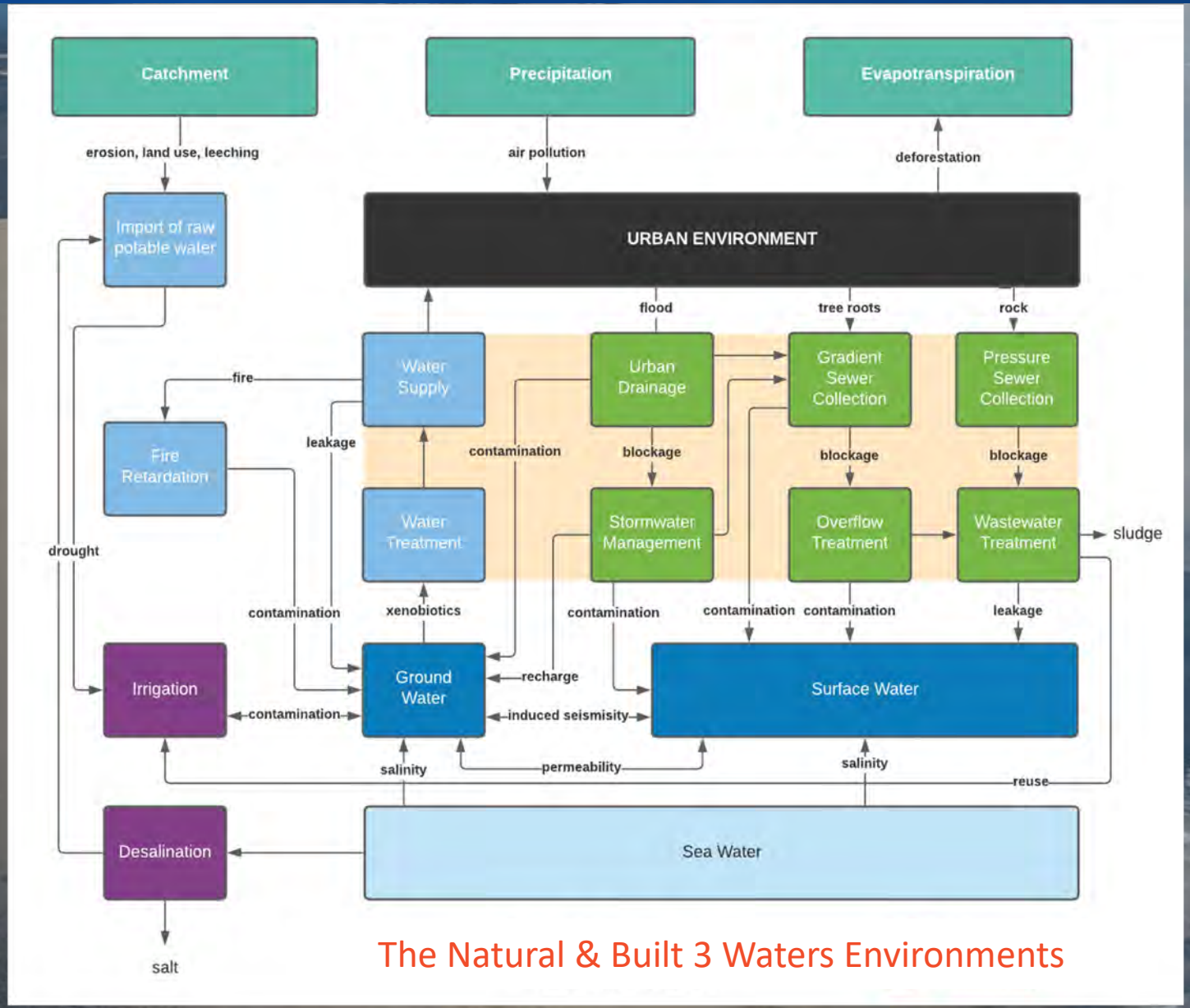
Multiple continuums to be considered...



Multiple continuums to be considered...



Natural & Built Environments



The Natural & Built 3 Waters Environments

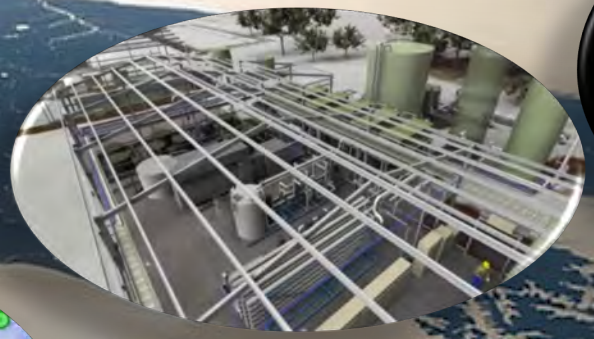
Meta Moto
Navigating the Future

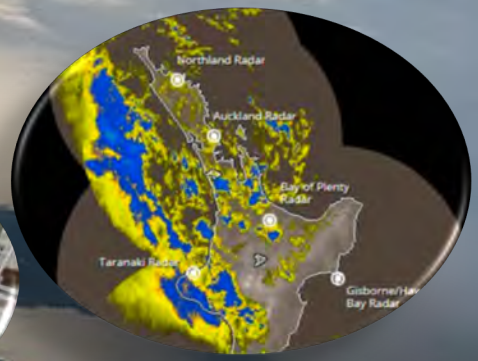
Natural & Built Environments
Digitally represented as One and Continuous

spicae

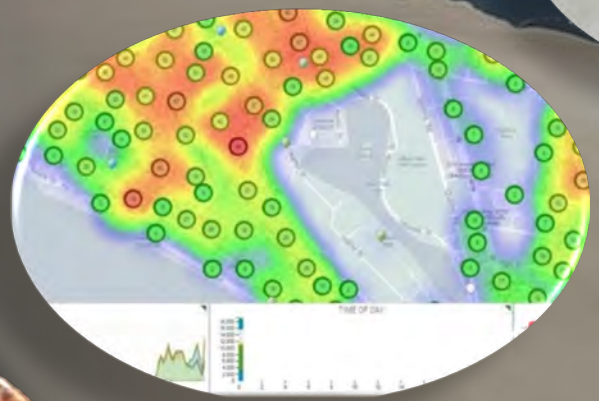

VR Asset inspection

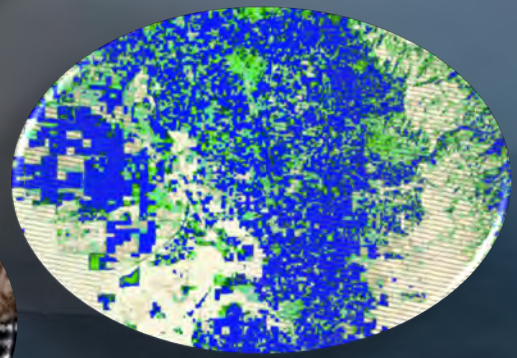
Industrial IOT

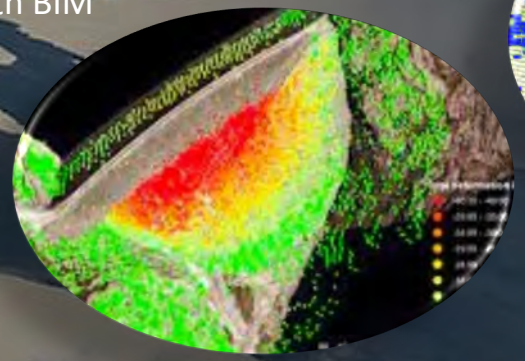

Digital Engineering with BIM

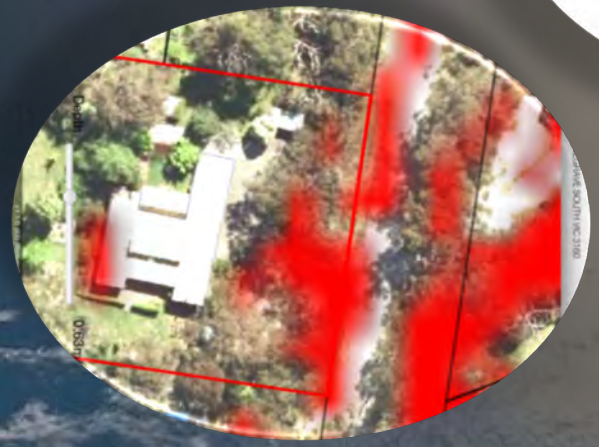


Weather Data

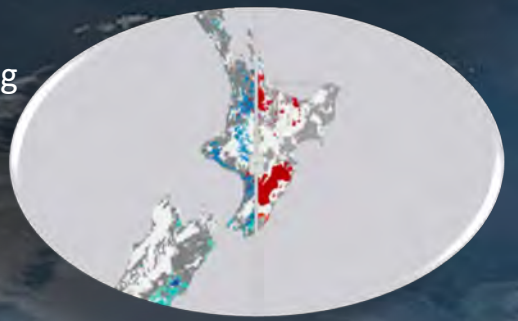

Spatial Business Intelligence


IR and Evapotranspiration

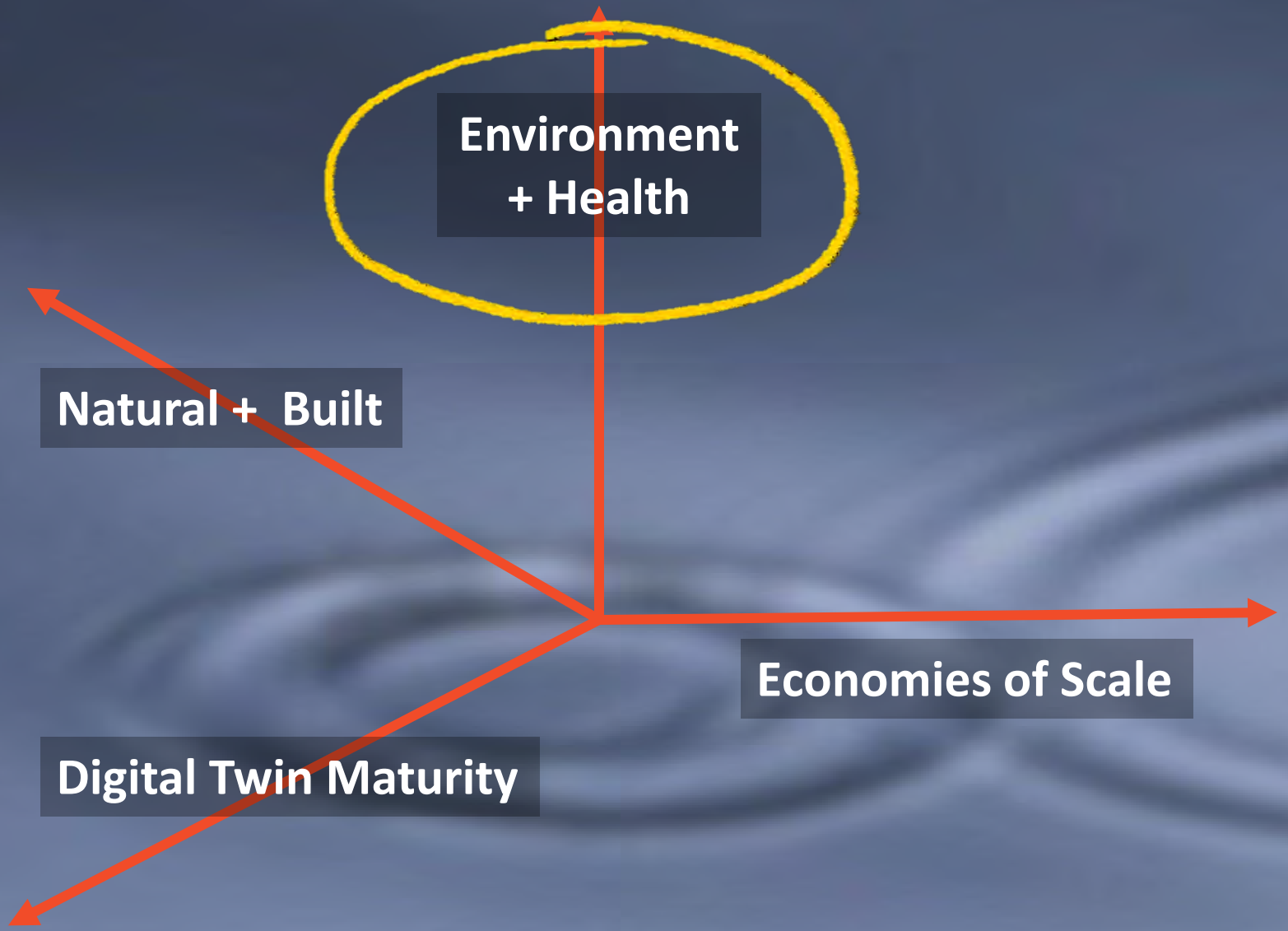

InSAR deformation monitoring


Probabilistic modelling of natural subterrain features

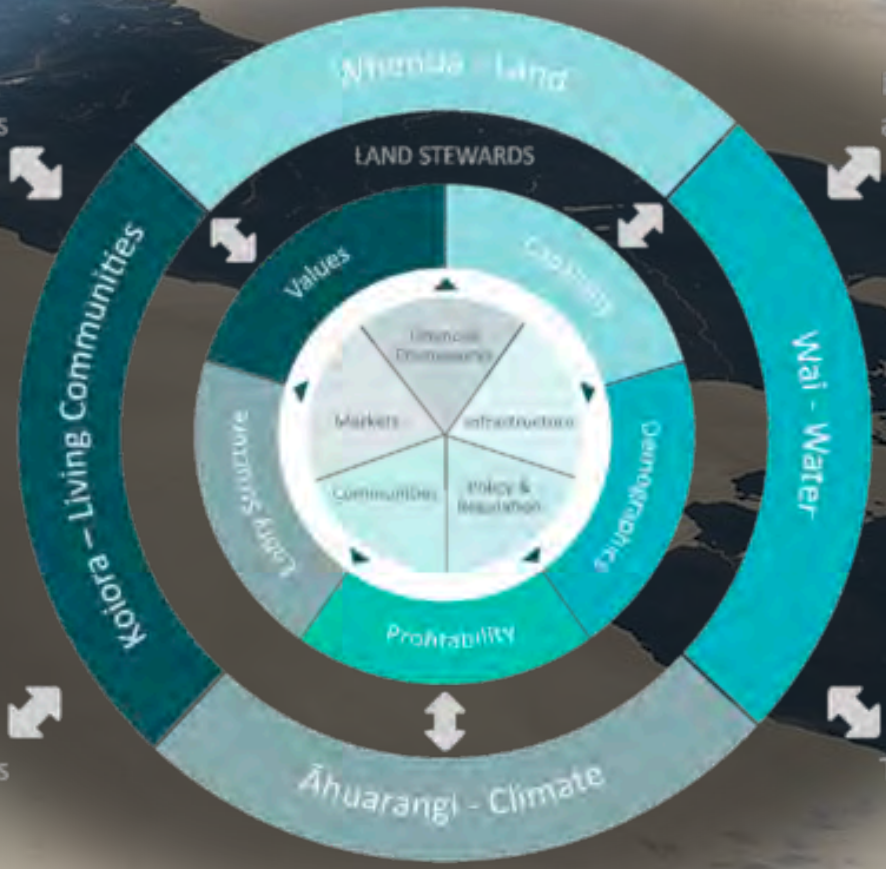

Augmented Reality of subterrain assets


Nitrate contamination

Multiple continuums to be considered...



Environment & Health Continuum



Taiao ora, Tangata ora.

If the natural world is healthy, so too are the people.

Inaugural Digital Earth Summit
Auckland, New Zealand (2006)

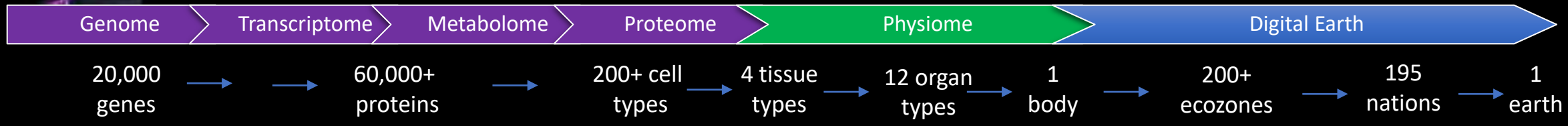
"..The Digital Earth Summit is timely. There is a growing feeling that we are at an important cross roads of our planet's history.

We are facing very challenging global issues, from the threat of change to our ecosystem, to a reduction in our biodiversity, the fast depletion of finite resources, and the rise of so many mega cities. Integrated data management can help us meet those challenges..."

Prime Minister Helen Clark - Digital Earth 2006

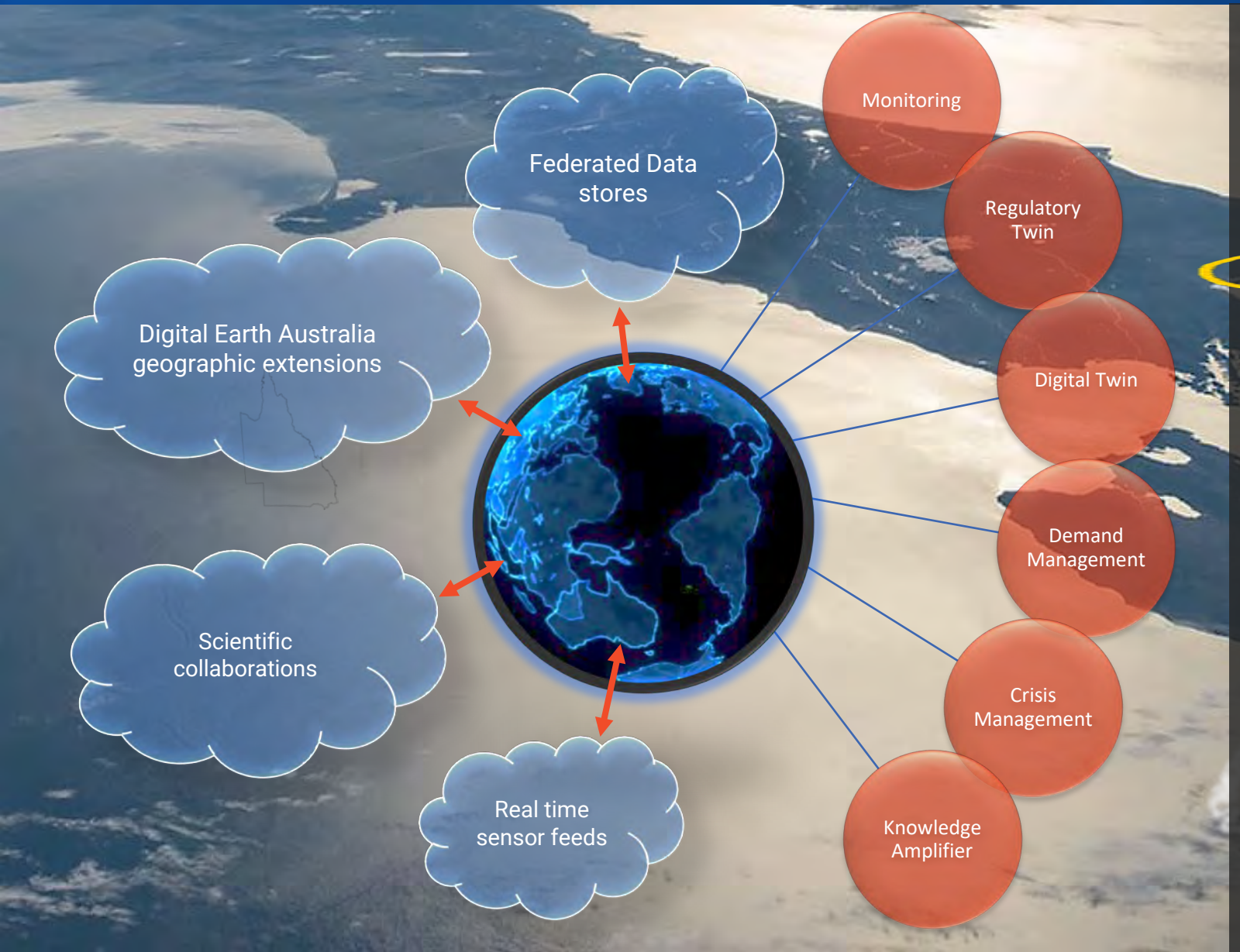
Environment & Health Science Continuum

GLOBAL SCIENTIFIC COLLABORATIONS	SPATIAL SCALE	TEMPORAL (TIME) SCALE
Digital Earth	From atomic scale to the size of the earth. **10^{16}**	From microsecond events (e.g. Brownian motion) to age of the earth **10^{22}**
Physiome	Diameter of an ion channel to scale of a human body. **10^{9}**	From microsecond events (e.g. Ion channel gating) to human lifespan. **10^{15}**
Human Genome	The human genome has 30,000 genes, each with 3,000 base pairs containing 1,000 amino acids. **10^{8}**	From atomic events to protein synthesis. **10^{5}**



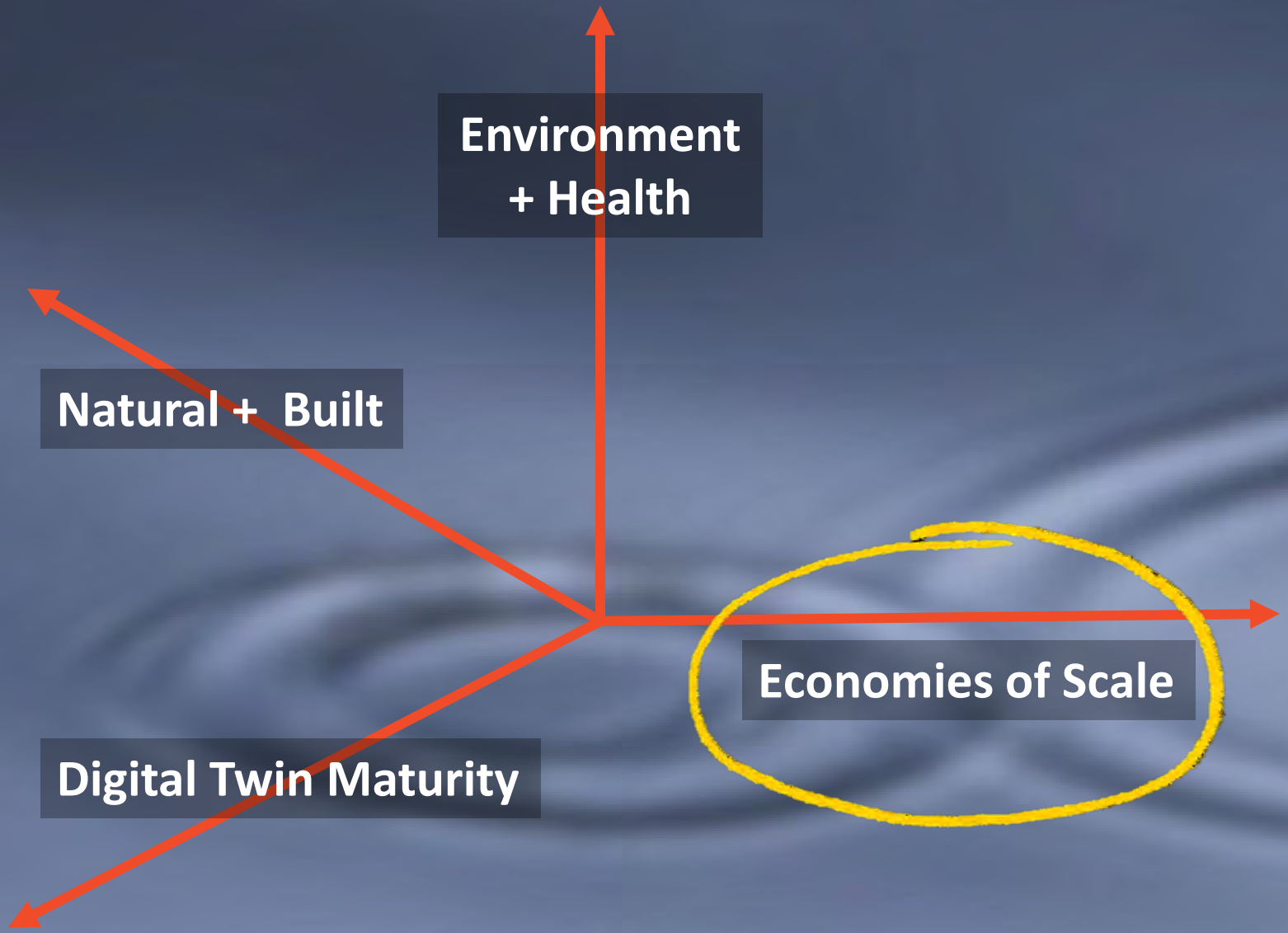
Adapted from Hunter, PJ and Borg, TK. Integration from proteins to organs: The Physiome Project. Nature Reviews Molec & Cell 4:237 243, 2003

Digital Earth NZ

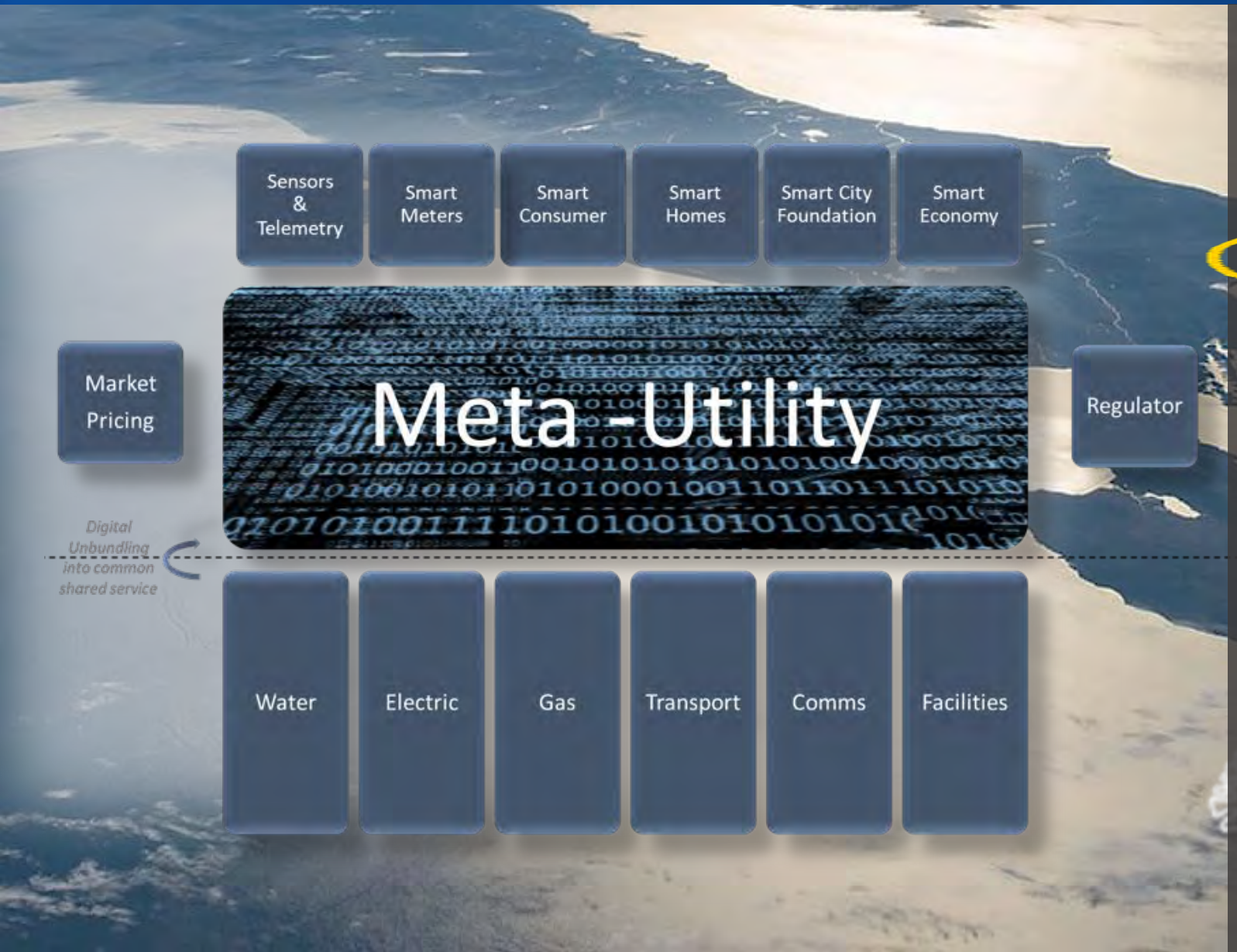


- Agriculture (tracking, precision ag etc)
- Regulations (3D Cadastre,
- Demand Side Management
- Health and social well-being
- Mining
- Property Services
- E-Planning (approval and consenting)
- **Meta-City and Meta Utility foundation**
- Construction
- Utilities and asset management
- Transport (including ITS, congestion charging etc)
- Communications
- Biosecurity
- Environment
- Seismic monitoring and warning
- 'Smart' cities
- Carbon and water trading
- Training
- Weather
- Economic development
- Defence, security and emergency services
- Space
- Climate Change (real-time sensing, dashboard etc)
- Pandemic Management
- Evidence informed policy making
- Scientific collaboration
- Technology Innovation and export Knowledge Economy

Nation-wide Water Services Continuum…

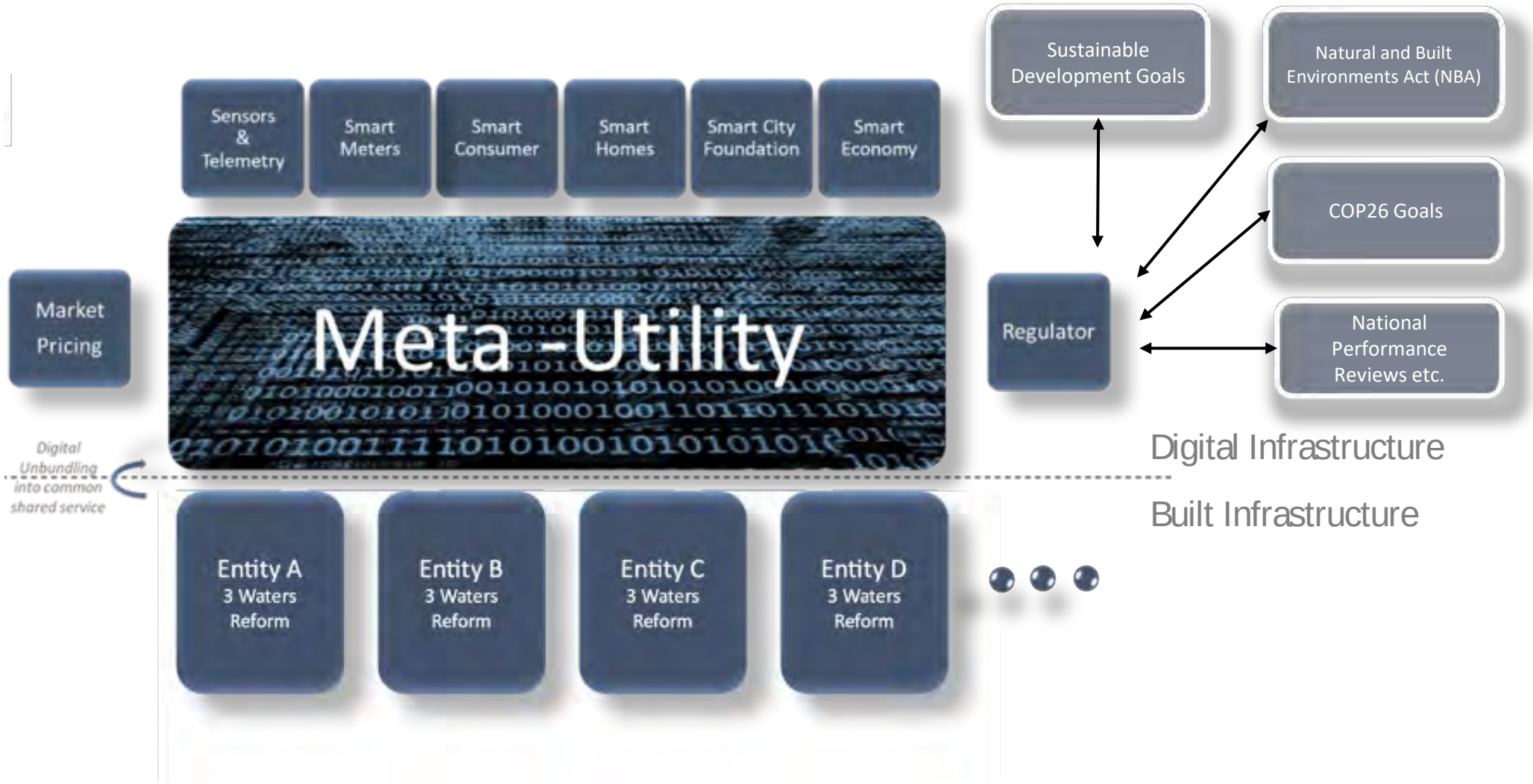


The Emerging Meta-Utility
(Industry 4.0)

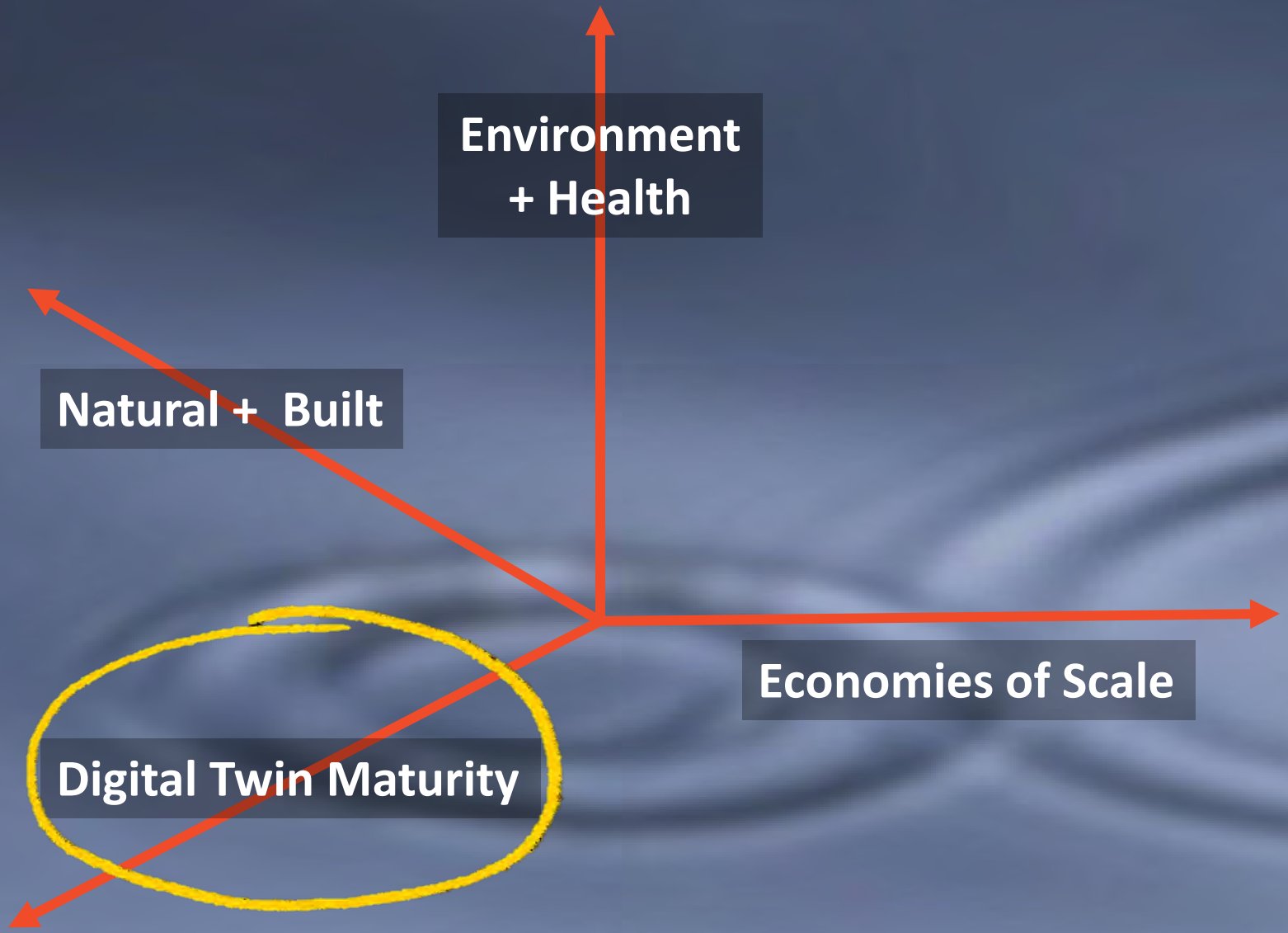


- Increasing complexity in managing digital utility
- Data Science – new levels of potential to optimise asset performance
- New 'smart' frontiers for utilities - smart homes, smart metering etc.
- Digital Twin and Regulatory Twin
- Open Banking – rapid emergence of new fintech
- Pairing of complementary services – eg. sewer gas for power generation
- Improved situational awareness –spatial decision support with real-time events.
- Growing Cybersecurity demands –reducing catastrophic risks.
- Meeting 21st Century challenges - Climate change, extreme weather, sea level rise, aging infrastructure, epidemics, rapidly retiring workforce etc.
- Co-location Management –The collective knowledge of natural and built environments
- Economies of scale – accumulated benefits for improving the performance of all utilities (large and small, rural and urban)

Seamless “Utility-as-a-Service”

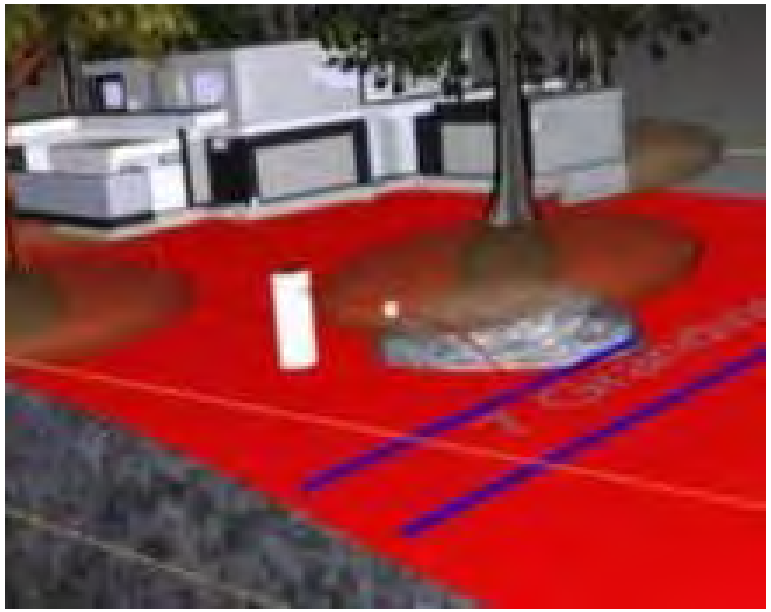


Whole of Asset Lifecycle Continuum…



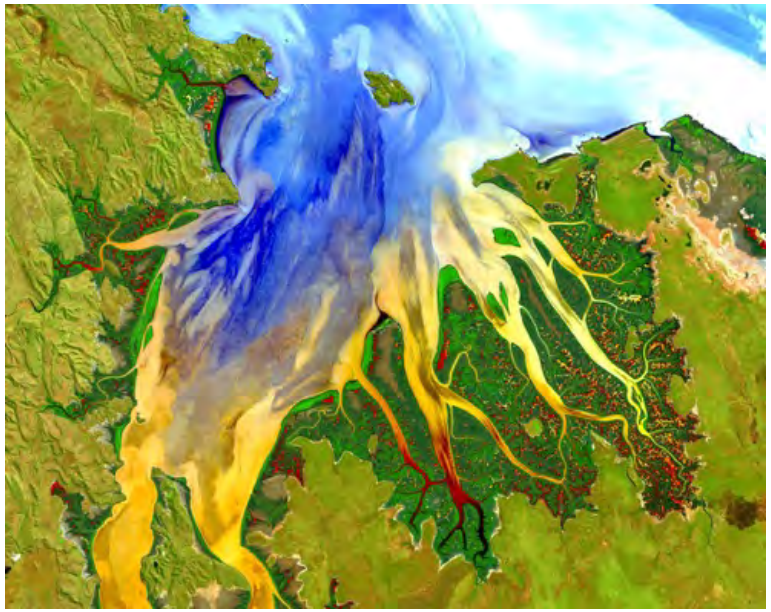
What is an Asset?

- ISO 55001 defines Asset management as the *"coordinated activity of an organisation to realize value from assets"*.
- Assets are defined as : *"An asset is an item, thing or entity that has potential or actual value to an organisation"*.



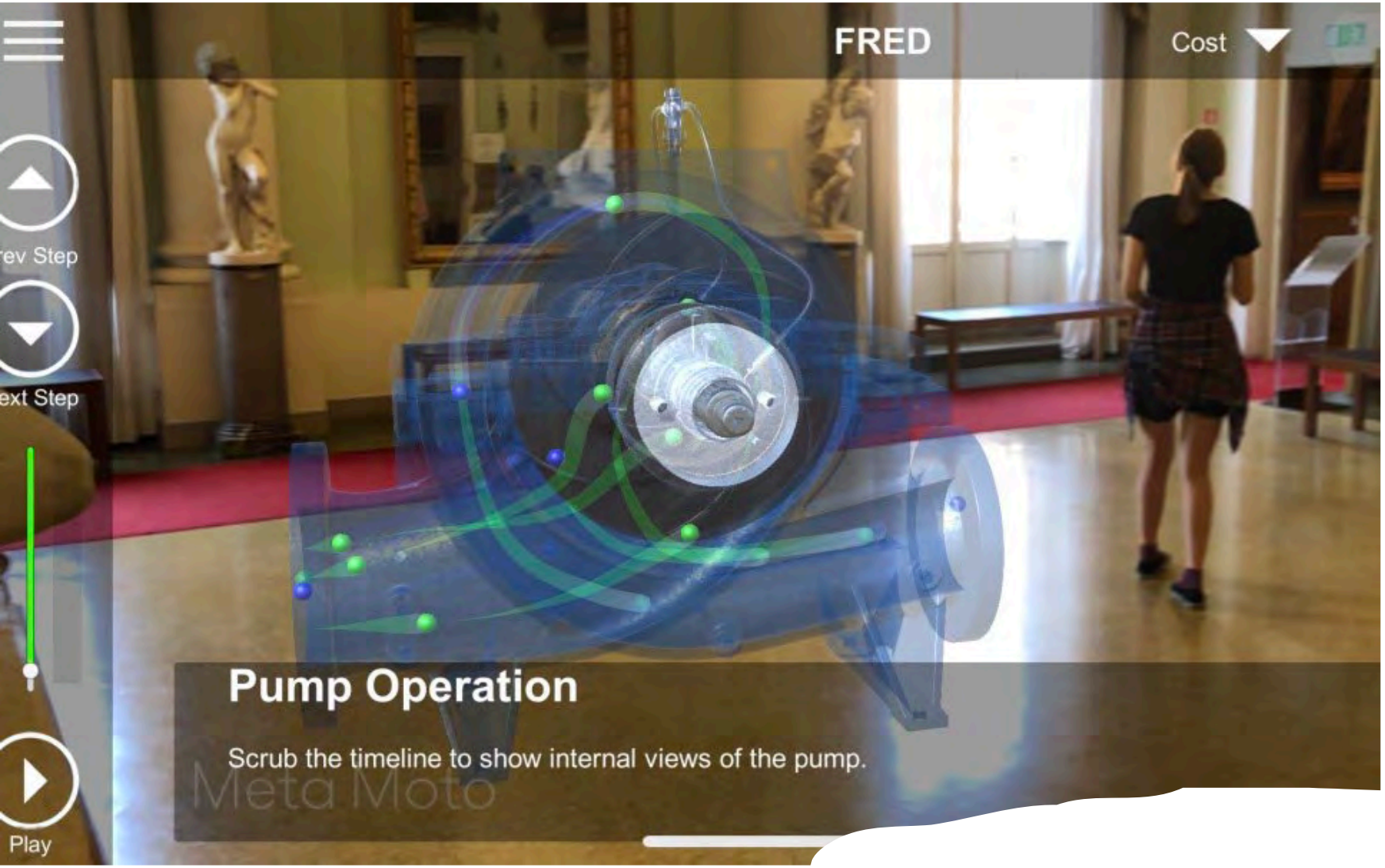
Digital Twin

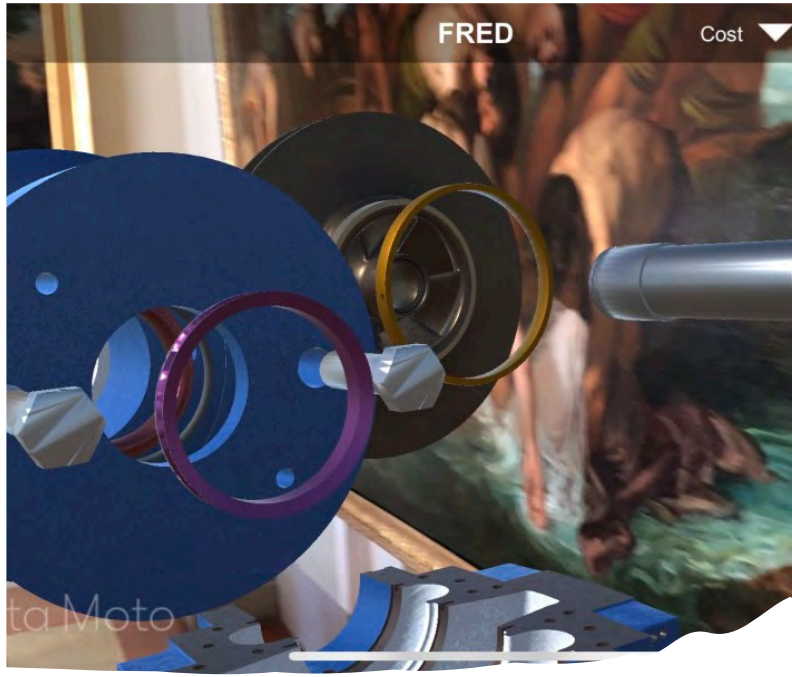
Sentient Assets

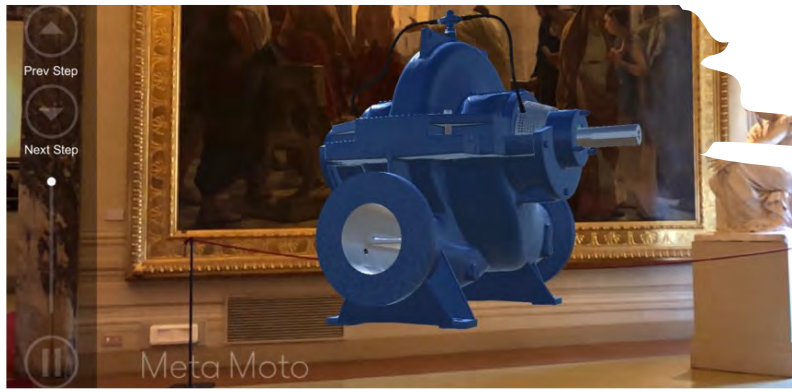


Spatially Dynamic Assets

3-D, 4-D, 5-D + Cyber-Physical Assets

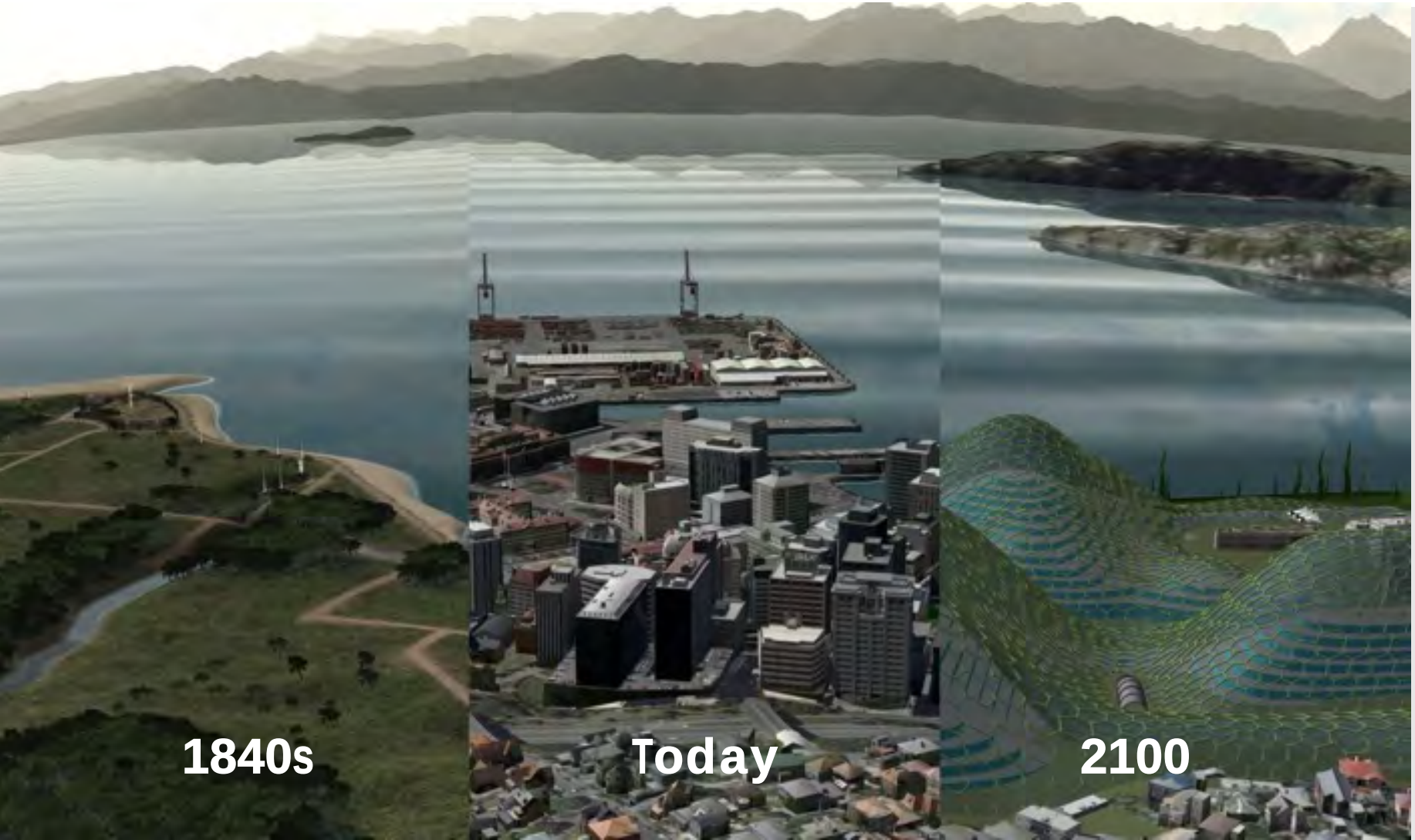






Time Machine
Places & Events through Time

NZ National Library



Te Whanganui-a-Tara (Wellington)

Interacting with 3D Wellington through three windows in time

Client: National Library of New Zealand for Big Data | Changing Place reopening exhibition (2012)
– Richard Simpson (curator)

Seamless Asset Information Management

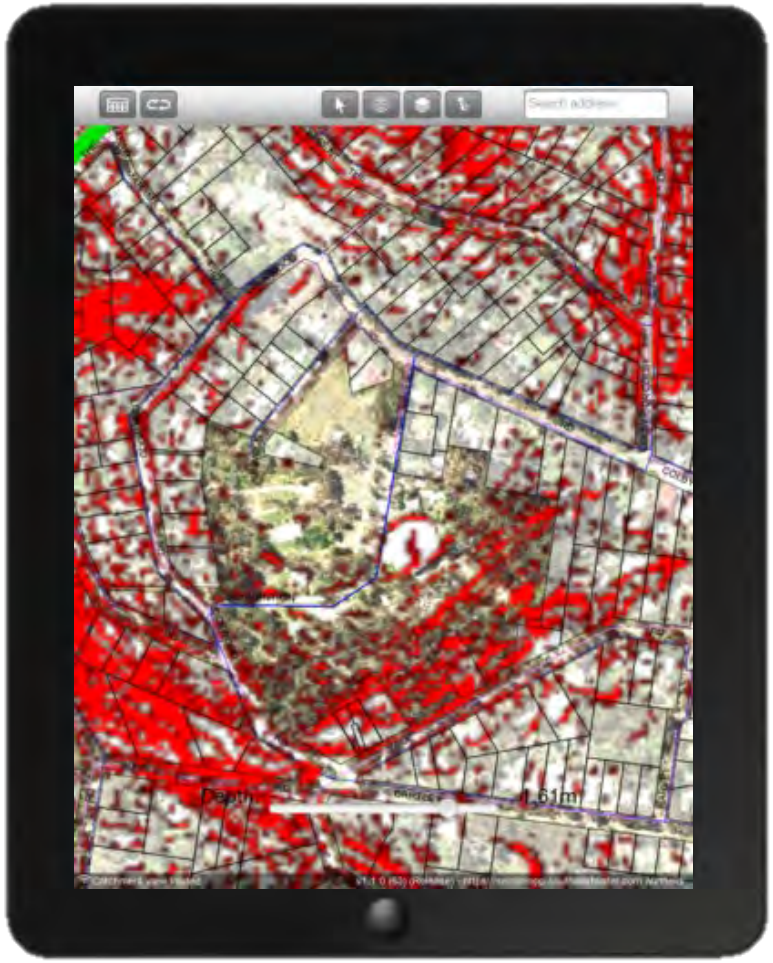
South East Water: SIM

Topological and semantic harmonisation of vertical and horizontal assets (BIM + Geospatial)

Making the invisible visible

South East Water: SIM

Probabilistic modelling of subterrain rock at Belview Heights for owner consultation & optimal placement of pressure sewer

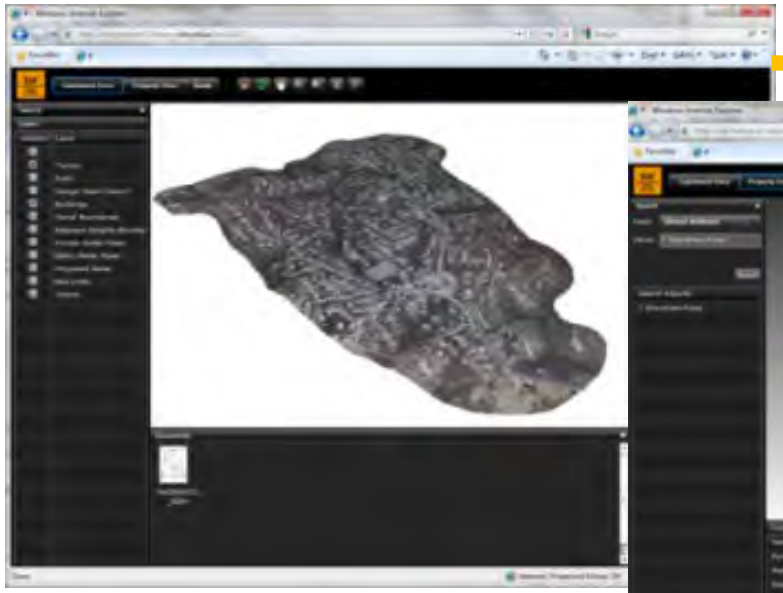


Making the Intangible Tangible

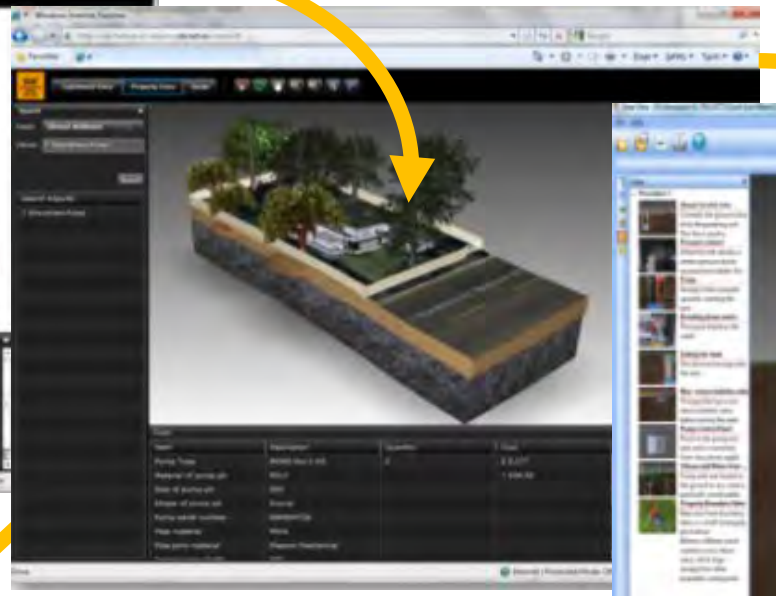
South East Water: SIM

Valuable insights can be derived from investments in rich multi-dimensional data, and with knowledge mapping to models.

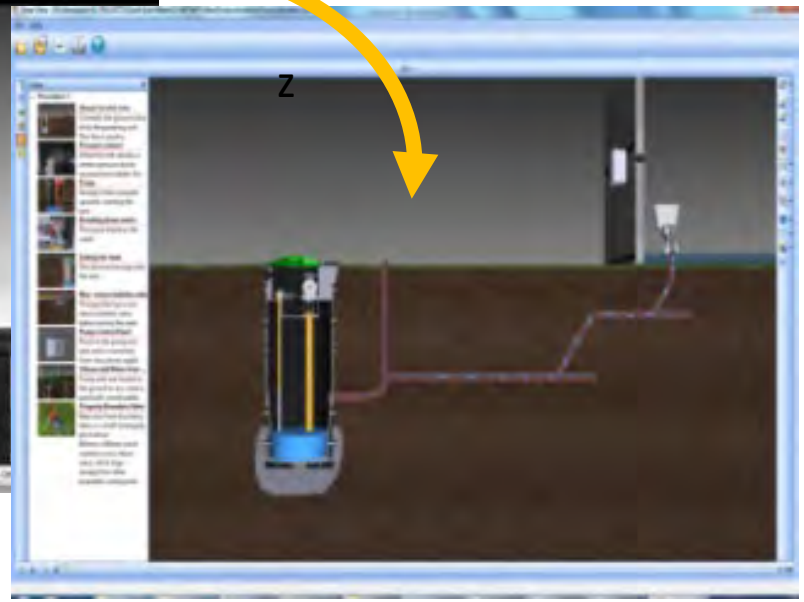
Automated derivative synthesis



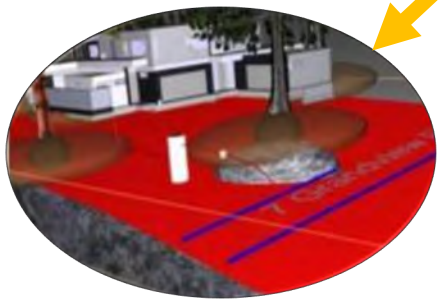
3D Catchment View .



3D Property View
– for home owner, inspectors,



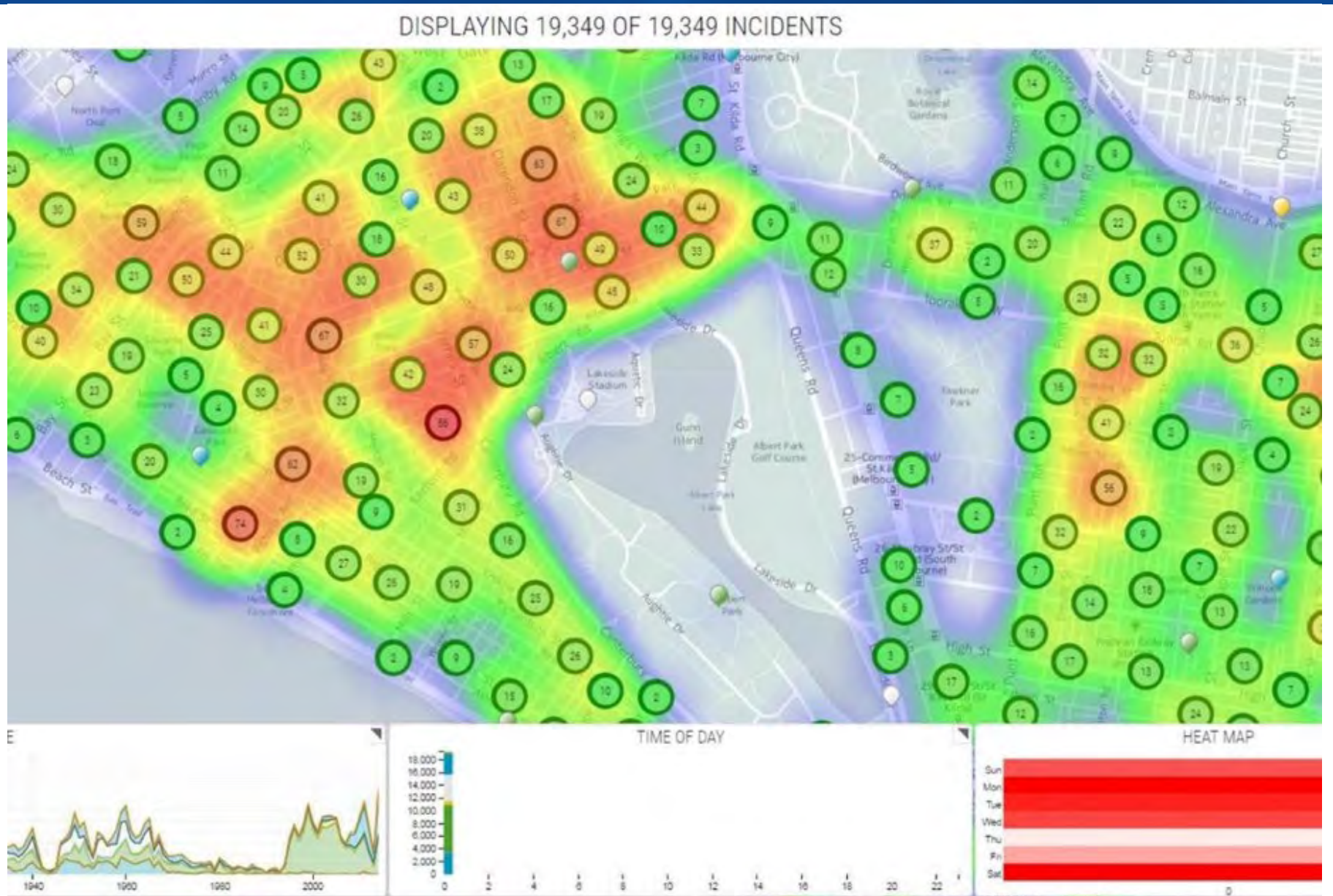
3D Operations View
bespoke installation and maintenance for on-demand instruction and training (3-D pdfs).



Collision detection determined between underground assets derived tree root bulbs.

Ensuring evidence informs decisions

South East Water: SIM



Industry 4.0 & Cyber-Physical Digital Twin

Meta Moto
Navigating the Future

spicae

The Operational Technology (OT) world

The Integrated IT / OT world

Reporting

What happened to my asset?

A representation of operational data from sensors and OT systems.

Analysing

Why did it happen?

Analysis of historical trends and potential root causes of failure /deterioration.

Predicting

What might happen next?

Modelling likely future behavior based on analysis of operational parameters.

Integrating

Bridging the IT/OT divide

Combining operational models with enterprise and external data for an operational and strategic view of assets - and the enterprise - in context.

Prescribing

Recommending actions

The Digital Twin as part of a comprehensive multi-dimensional enterprise analytics capability, using artificial intelligence (AI) to recommend interventions and prescribe courses of action across the value chain.

Autonomous Decisioning

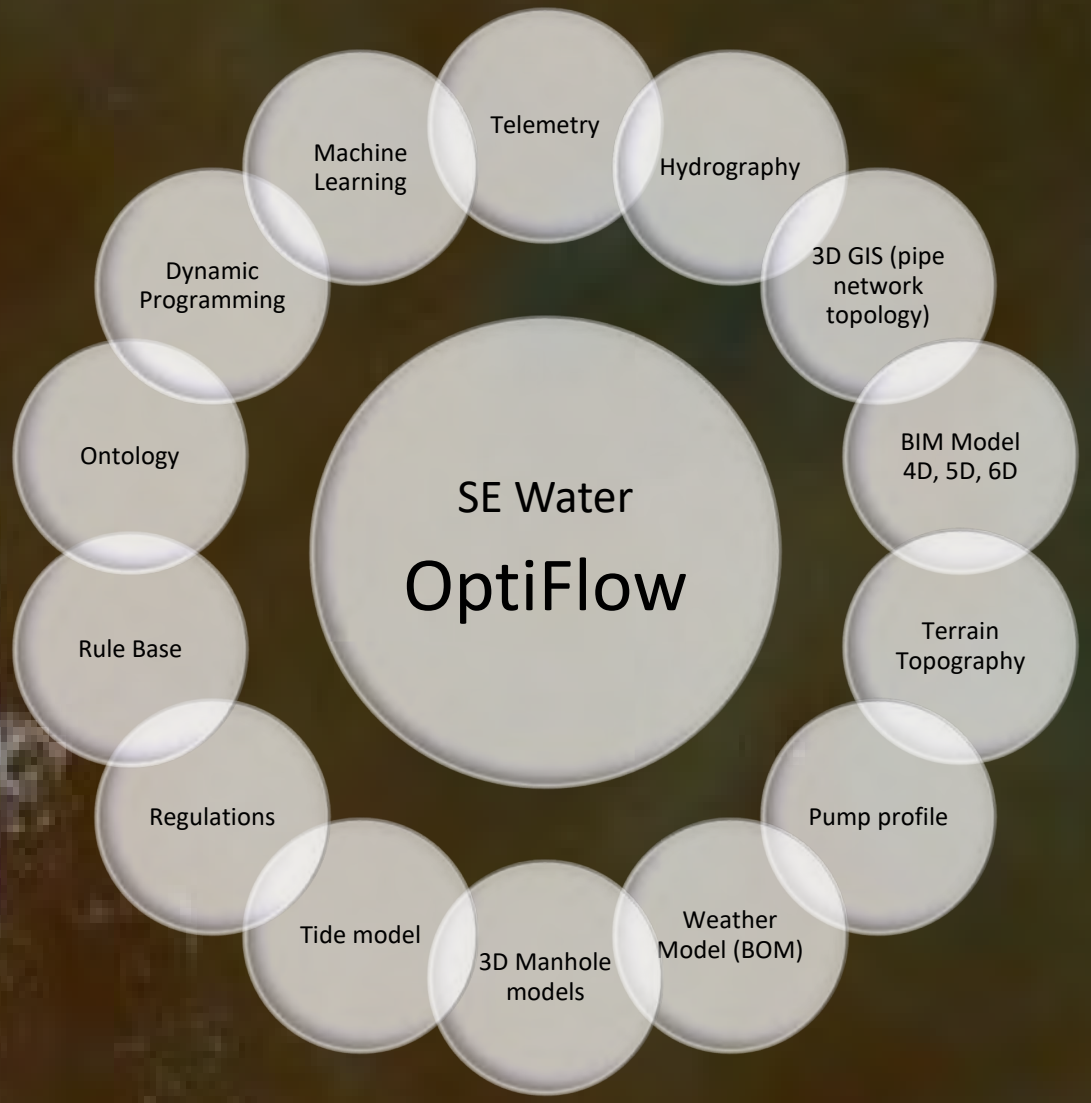
Taking actions, automatically

Digital Twins at the heart of the future enterprise, able to autonomously make interventions and take new courses of action to maintain and enhance efficiency, quality, profitability, reliability, safety.

and when Shit happens ....

South East Water: SIM

- OptiFlow (pilot project) is a real-time operational system and detects early sewer spills.
- Provides real time sewer network modelling, controls and flows.
- Takes hydraulic models, calibrates them with real-time data and allows operators to run scenarios and investigations across the whole network.
- Samples data sent every 2 minutes from SCADA
- Provides operators with early warning of issues and recommendations on the best way to resolve the issue
- System supports self learning and prescriptive diagnostics.
- Enables knowledge exchange within the workforce



Advanced application of a Mature Digital Twin with future-state readiness

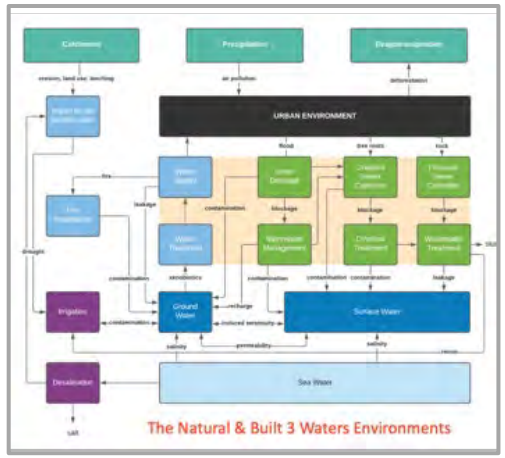
A Language of Progression for Digital Twin

Purpose: Must have clear purpose	**Public good** Must be used to deliver genuine public benefit in perpetuity	**Value creation** Must enable value creation and performance improvement	**Insight** Must provide determinable insight into the built environment
Trust: Must be trustworthy	**Security** Must enable security and be secure itself	**Openness** Must be as open as possible	**Quality** Must be built on data of an appropriate quality
Function: Must function effectively	**Federation** Must be based on a standard connected environment	**Curation** Must have clear ownership, governance and regulation	**Evolution** Must be able to adapt as technology and society evolve

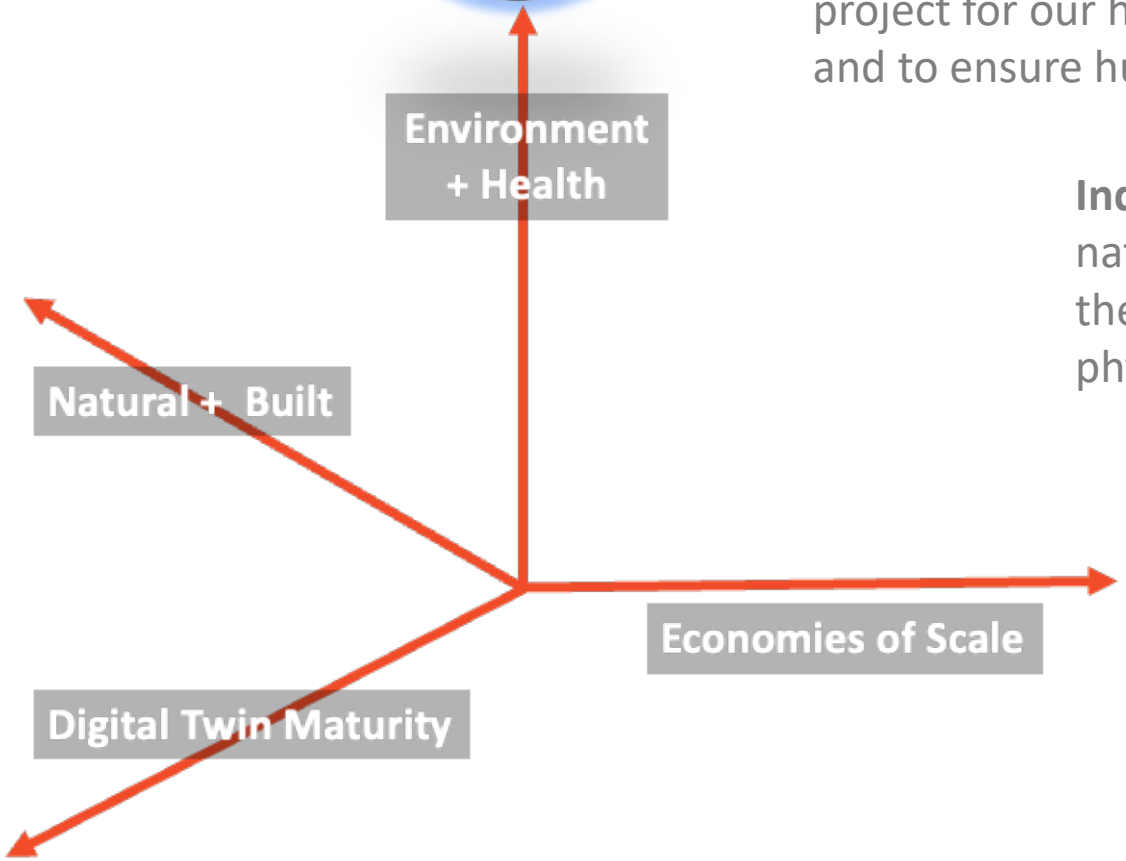
Gemini Principles for Digital Twin

In Conclusion...

"One and Continuous
Built & Natural Environment Modelling"

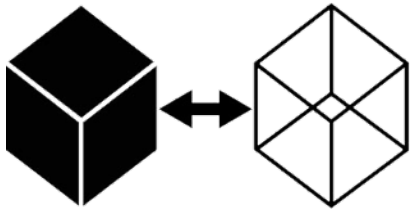


Digital Earth New Zealand
International collaborations to build a knowledge accelerator based upon an open an innovative spatial digital commons. A critical scientific and technological project for our health and environmental wellbeing and to ensure humanity and this planet have a future.



Industry 4.0 Water Utility Seamless nation-wide 'Utility as a service' separating the roles for digital curation from the physical stewardship of water assets

Industry 4.0 Thinking
With maturing Digital & Regulatory Twins



Meta Moto
Navigating the Future

The Ultimate Digital Twin is Digital Earth

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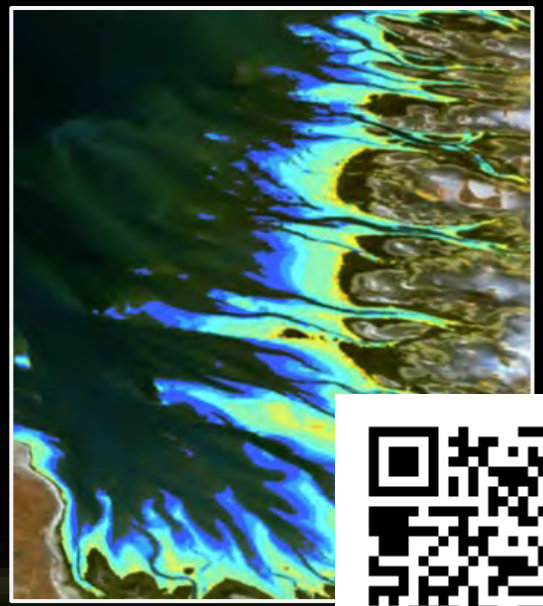

AUSTRALIAN WATER REFORM ROADSHOW

THANK YOU FOR YOUR ATTENDANCE

RECORDING & SLIDES WILL BE AVAILABLE FROM:
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