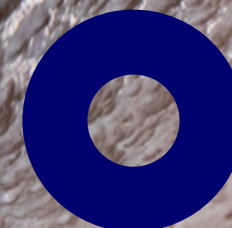


Sydney
WATER

Innovation Research and Deployment Plan



Innovating for success

Our approach



At Sydney Water, we strive to deliver better services for our customers, our city and Country. Innovation is key to understanding what we can do better as an organisation and how we can collaborate with our research and innovation partners to develop and deliver new solutions. We're investing strongly in research, innovation and new technologies that enable the delivery of more resilient, new and better services to all our customers so that Greater Sydney continues to be a thriving, liveable and sustainable region for generations to come.

Our Goal

Empowering a culture of innovation to advance the delivery of world-class water services

Our plan is all about delivering change within our business that improves our infrastructure, operations and the way we work. Key to this is our people. They're fundamental to the change that's needed. We're creating a culture within Sydney Water that supports innovation and bringing those ideas to life.

We also value our long-term partnerships which are essential to delivering innovative solutions for complex asset and operational challenges.

Together, we can explore new ways to achieve sustainability and liveability goals for customers and the community.

Making a difference

We have a strong track record of delivering significant benefits from our investment in research and innovation. This plan builds on those achievements and outlines where we're pivoting to ensure we have stronger engagement with the market and see real benefits on the ground.

Our investment in innovation spans four horizons to ensure the organisation is well positioned to respond to and take advantage of both short-term tactical needs and longer-term strategic opportunities.

This plan highlights a higher priority for deployment of research and innovation outcomes to ensure the business benefits from our investment are fully realised and we deliver value for our customers, shareholders and regulators.

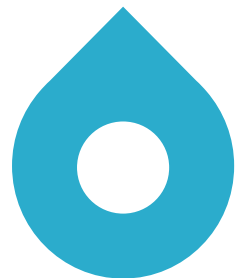
Where needed or where the opportunity arises, we'll also look at ways to fast track or accelerate projects so the business can benefit sooner. We'll also explore options for commercialisation of research and innovation outputs for financial or broader community benefit where it makes sense.

Looking ahead

Our key priority areas include new opportunities in the circular economy, alternative water sources, and smart asset management. We have a specific focus on new growth areas in Western Sydney and how we can contribute to improved liveability outcomes through urban greening and cooling. We're also looking at enhancing our pilot trial facilities to further validate new technologies and increase adoption.

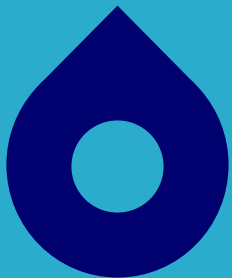
The success of this plan will rely on our strong partnerships and a collective desire to innovate and learn as we go. We can't do this alone! So, we invite you to come and collaborate with us to deliver our plan and we look forward to working with you to achieve our goal.

Chris Gould
General Manager
Business Development



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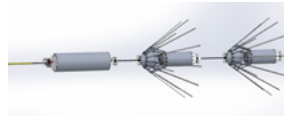


How R&I is making a difference

We're building on our strong legacy of research and innovation. Over the last decade we've invested over \$35 million into R&I. We've leveraged scientific evidence and market capability and created new knowledge and customised technologies to make significant improvements to our operations, environment, water quality and communities.



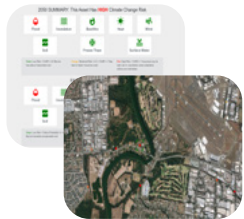
Increased water savings through acoustic leak detection, pipe failure prediction model and robotics



Condition assessment of critical water mains without disruption to service



Preparing for the next drought by investing in water conservation initiatives



Embedded climate change resilience into asset planning through development of the XDI tool



World-leading COVID-19 sewage surveillance, developed and deployed within six months



Preventing sewer chokes and overflows using AI, robots, customised sensors and predictive models



Energy generation, capture and reuse, including co-digestion



Greener and cooler cities, supported by new understanding of water in the landscape



Better quality drinking water despite challenges from fires and floods – by understanding and improving treatment of natural organic matter (NOM)



Changing the pace of innovation and adoption

We're focusing our R&I investment to deliver stronger outcomes for the business which include:

- increased investment
- better focus and investment to aid deployment
- working with our Regional Delivery Consortium
- more targeted partnerships
- resource sharing and capability building with research and industry partners
- stronger focus on Western Sydney
- open innovation approach and working with the market to solve problems
- increased cross-organisational engagement with R&I
- increased visibility of idea capture and management
- supporting change management across the business
- enhancing measurement of the pace of innovation (impact, collaboration and perception).

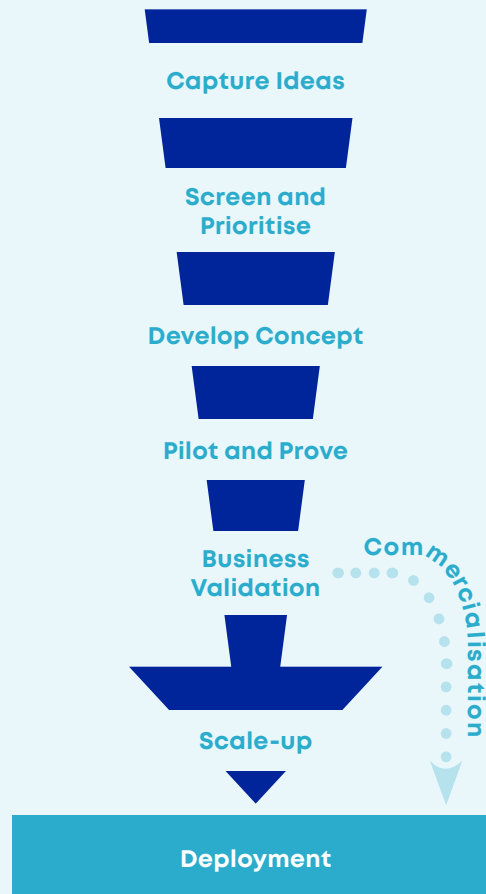
Innovation, Research & Deployment Plan

Goal: Empowering a culture of innovation to advance the delivery of world class water services

Sydney Water's strategic outcomes

R&I priority areas		
	First choice of customers and partners	• New products & services
	High performance culture	• Open innovation • Capability building
	Thriving, liveable and sustainable cities	• Sustainable smart cities • Circular economy & resource recovery • Reliable & resilient water supply • Healthy waterways & environment • Assets & operations
	Successful and innovative business	• Horizon scanning • Pilots & technology trials

Our pipeline



Enabled by



Measures

Innovation effectiveness index

- Impact
- Collaboration
- Perception

Industry recognition

- Industry and research grants
- Awards
- Publications and presentations

Business benefits

- R&I benefits tool
- Adoption

20%

Horizon 1 (1 - 2 years)

35%

Horizon 2 (2 - 5 years)

30%

Horizon 3 (5 - 10 years)

15%

Horizon 4 (10+ years)

Collaborating with our partners

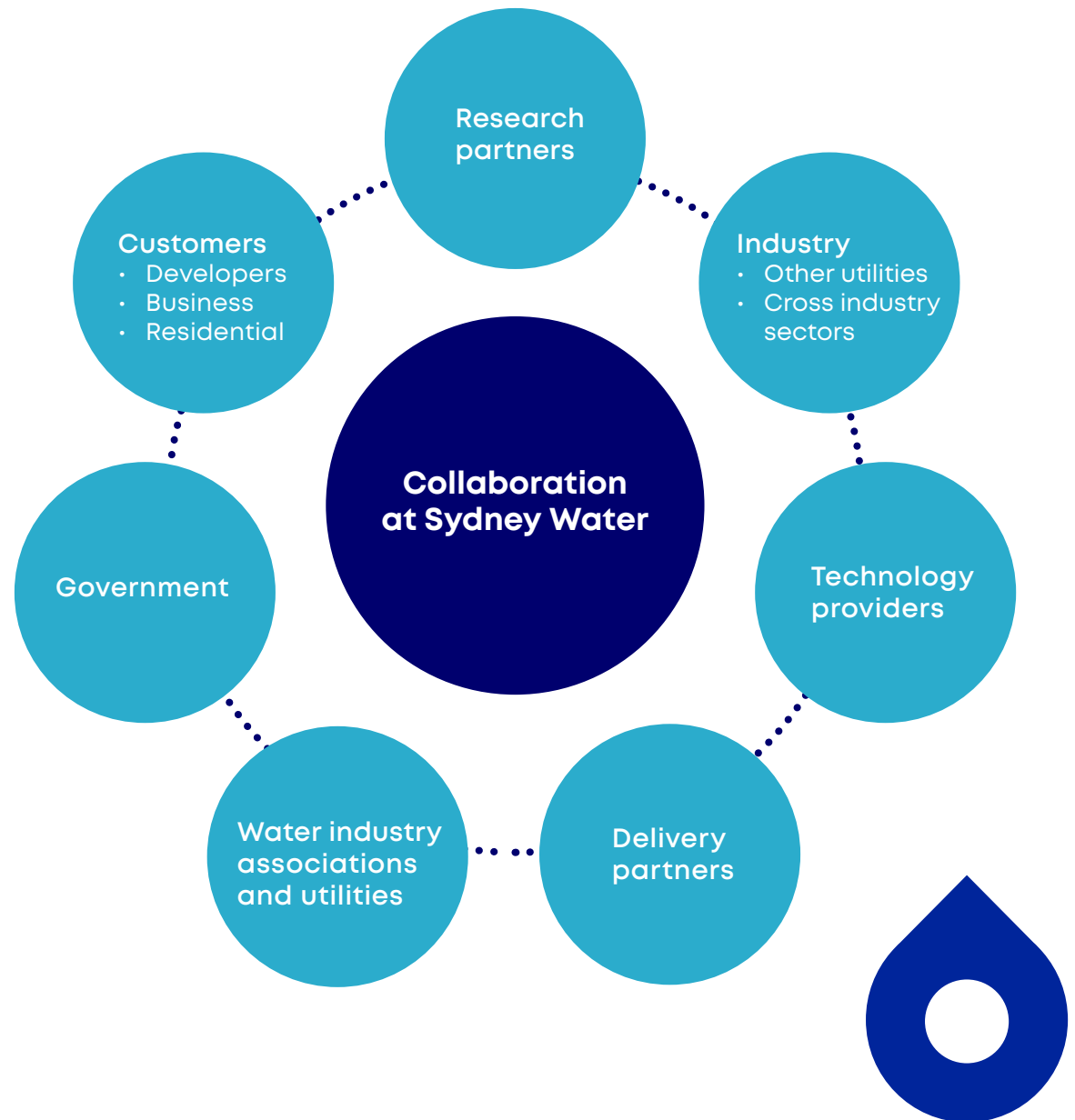
Collaboration with our partners is an essential element to our success in identifying and developing new ideas to solve critical or emerging business challenges. We're working with over 50 partners to deliver our program, including university, research, industry and government partners. Our focus going forward is to also build stronger connections with developers who can adopt new innovative approaches in both new growth areas in Western Sydney and infill developments.

Under our new plan we're also seeking to broaden our collaborative partnerships, extending into other utility sectors and supply chain partners.

Working together on the many complex challenges that are common to water utilities helps to share the costs of finding potential solutions. It also enables us to effectively leverage our investments and knowledge to deliver benefits not just for Sydney Water but for the broader water industry and the community.

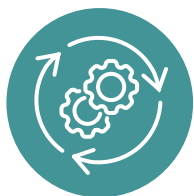
Our collaborations extend from major projects on optimising our assets and operations to exploring new innovative opportunities in both greenfield and infill areas, through to smaller engagements where we provide data and wastewater samples to support external research projects.

Collaboration helps to build knowledge, capability and a 'can do' culture within our business and through our innovation and knowledge networks. We proactively promote our collaborative projects through various media channels, as well as delivering joint presentations and papers and seeking industry recognition through state, national and international awards.



Enablers of R&I

To successfully deliver our Innovation, Research & Deployment Plan we'll rely on five key technical, cultural, financial and social drivers. These enablers will be key to ensuring we effectively drive our Innovation, Research & Deployment Plan from prioritising ideas to realising the benefits through implementation.



Innovation ecosystem

Sydney Water's innovative culture means our people are continuously exploring new ways of improving services.

We're harnessing the ideas of our people and encouraging a collaborative multi-disciplinary approach across the business by:

- expanding use of our open innovation platform and tech trial facilities
- continuing the successful 'Wave' program
- hosting the Sydney Water Innovation Festival in partnership with Northumbrian Water Group in the UK
- delivering horizon innovation grants and sprints.



Collaborative partnerships

As pace of innovation adoption becomes more rapid, we're building strong collaborative partnerships with a broad range of stakeholders to enable us to achieve our strategy and business objectives in shorter timeframes.

Partnering on projects means we can achieve better outcomes, including:

- co-design solutions harnessing leading expertise and knowledge sharing
- harness supply-chain partnerships to deliver new products and services
- University Collaborative Partnerships – leverage universities' facilities and expertise to enable higher risk R&D in a lower risk environment.



Technology and digital innovation

Advances in computer science, IoT artificial intelligence and data analytics underpin all areas of modern business and science.

We'll harness these technology enablers to support digital transformation across the business to drive evidence-based decision making for sustainable resources and asset management. Technology will enable R&I through:

- digital and innovation upskilling
- digital innovation sandpit
- R&I proof of concepts, harnessing novel and emerging technology
- digital technology trials.



Leveraging investment

We can leverage our R&I investments by joining forces with research, industry and government partners, and as a result achieve better value for money and enhanced outcomes, such as:

- multi-partner collaborative projects
- leveraged federal and state grants
- harness private sector investment
- IP and data sharing arrangements
- access to cutting edge equipment and facilities.



Value capture and deployment

We can deploy innovative solutions in the business, allowing us to capture the most value from our investments:

- R&I benefits tool to determine productivity, cost efficiency and gains
- operationalisation of outcomes to improve delivery of services
- best practice implementation framework
- resourcing deployment to enhance adoption
- support and inform regulation.

Measures of R&I success

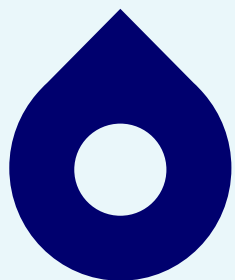
The Innovation, Research & Deployment Plan has three performance metrics to assess R&I implementation. The metrics ensure our program is delivering benefits to the business and supporting Sydney Water's key objectives.

Innovation effectiveness



As Sydney Water is constantly enhancing its innovative capability across the organisation through our Blue Bus program, our Innovative Effectiveness Index (Index) has been revised to take us to the next level. The revised Index includes not only internal and external perception measures, but the collaboration, impact and pace of innovations adopted across the organisation to enable innovation agility.

These measures all contribute to enhancing Sydney Water's innovative culture.



Industry recognition



To support Sydney Water's vision of being a world-class utility, industry recognition is a key leading indicator. We've established a strong track record of industry recognition to date through our collaboration with leading global research organisations and industry partners.

This is measured through invited industry wide presentations, federally and state funded government research and industry grants, peer reviewed international and national journal and conference papers, in addition to research and industry awards. To date we have received numerous state, national and international awards for our world-leading collaborative R&I projects.

Business benefits



The Innovation, Research & Deployment Plan plays an important role to deliver change and business benefits to improve the way we deliver world-class services, from idea through to implementation.

The R&I benefits tool measures both direct and indirect benefits of research outcomes that trigger business actions.

- **New knowledge** that solves or enhances our ability to meet new regulatory requirements or longer-term strategy outcomes such as climate resilience and integrated water management
- **Technology assessments and pilot trials** to assess business benefit to de-risk before it is operationalised
- **New innovative solutions** to solve business critical challenges where there are no off-the-shelf commercially available solutions



First choice of customers and partners

Research and innovation will drive the development of new products and services primarily for the benefit of Sydney Water and its customers. Where the opportunity arises, Sydney Water will also seek external market commercialisation for commercial, social and reputational benefit.

New products and services

We're seeking to take our research and innovation program closer to our stakeholders, customers and the community. For implementation of R&I outcomes to happen, we need our partners on board from the start – shaping the projects and looking at ways to ensure we can adopt outcomes and fully realise the benefits.

There are several ways we'll engage with our partners:

- Hosting or supporting pilot trials on or offsite to promote and showcase new technology applications for increased adoption
- Working with developers to explore new innovative technologies and approaches for new growth areas. This could include smart water efficient technologies for residential and commercial designs and ways in which we can contribute to reducing greenhouse gas emissions and urban heat
- Looking at how we can support research and community projects through the provision of samples and data
- Sharing our IP to enable faster scale up and deployment of R&I outputs
- Showcasing our partnerships through major industry events, e.g. Sydney Water Innovation Festival



COVID-19 sewage
surveillance program





High performance culture

Developing capability within and outside the organisation is essential in creating an innovative ecosystem and high-performance culture and workforce of the future. We need to be agile when it comes to delivering innovation and promote a 'can do' culture that enables and empowers our staff to bring forward ideas.

Open innovation

- Piloting our Hype platform to capture and progress ideas, putting key challenges out to staff and external customers and stakeholders
- Engage staff through our WAVE ideation sessions to find new solutions to high priority organisational challenges
- Deliver the Sydney Water Innovation Festival in October 2021, partnering with Northumbrian Water Group in the UK
- Celebrate Science Week including onsite exhibitions and talks showcasing the science and research projects with our partners

Capability building

- Leverage our University Collaborative Framework Agreement with existing university partners and roll out to others
- Internal upskilling events and technical seminars
- Access to internal and external trial facilities for staff to learn and evaluate new technologies and approaches
- Best practice R&I deployment framework
- New ideas captured centrally and shared with our people
- Leverage expertise from water and other industry sectors to build and promote new innovative approaches



Thriving, liveable & sustainable cities

Sydney Water is facing more complex and interconnected challenges arising from climate variability, population growth and regulatory changes, along with rising customer expectations. We're investing strongly in research, innovation and digital technologies that enable the delivery of more resilient and high-quality services through a circular, integrated water management approach. Our investments will ensure Greater Sydney continues to be a thriving, liveable and sustainable region for generations to come.

Reliable and resilient water supply

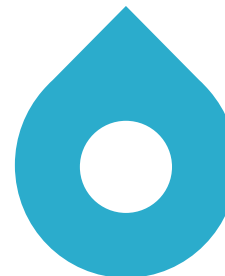
We're constantly improving our water quality management and monitoring systems to ensure we continue to provide high quality, safe and reliable water to Sydney Water's customers.

- Understand the long-term impacts of climate variability on raw water quality
- Understanding impacts of natural organic matter (NOM) to minimise disinfection by-products
- Cost-effective online monitoring for enhanced service delivery
- New monitoring and treatment solutions for contaminants of concern, natural organic matter, etc
- Microbial source tracking, including opportunistic pathogens
- Harnessing alternative water supplies including options for using purified recycled water
- Integrated water management for enhanced climate resilience
- Smart monitoring tools to optimise treatment in extreme weather conditions
- Innovation in water conservation

Sustainable smart cities

Sydney Water can contribute to improving the community's resilience to climate change through harnessing sensors, digital networks and analytics, especially in Western Sydney.

- Personalised, real-time water use insights for customers and communities
- Intelligent and integrated demand and leak management
- Harnessing smart sensing and decentralised stormwater and recycled water solutions for precinct cooling and greening
- Climate cross-dependency using the XDI tool
- Working with partners to deliver water smart solutions
- Harnessing smart sensing tools to support decision making





We're contributing to a more liveable Sydney

Circular economy and resource recovery

We're looking for sustainable treatment solutions, incorporating the recovery of valuable material, including energy, from our wastewater to reduce waste and minimise our carbon footprint, enabling zero impact on the environment.

- Identify resource recovery opportunities from biosolids and wastewater to contribute to the circular economy
- New opportunities to recycle water
- Sewer mining, including nutrient recovery
- Nutrient offsetting and trading
- Decarbonisation opportunities and solutions
- Food water energy nexus

Healthy waterways and environment

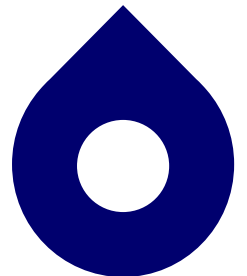
We'll contribute to healthy, swimmable waterways and clean beaches that our communities can continue to enjoy. To achieve this in a dynamic and rapidly growing city we'll require new, innovative and holistic approaches to catchment management to offset any environmental impacts.

- Advanced knowledge and treatment technologies for emerging contaminants of concern and trade waste
- Harnessing stormwater and recycled water for urban greening, cooling and environmental replacement flows
- Incorporate a whole of catchment approach to protect our waterways
- Explore indigenous land use and waterway values
- Optimise smart decision support tools to proactively manage environmental impacts from our operations
- Harnessing green infrastructure and solutions for treatment, nutrient and energy off-setting and recovery
- Exploring innovative technologies for water recycling
- Novel treatment technologies to meet regulatory compliance changes

Assets and operations

To meet customer expectations, we're striving to improve the performance, reliability and extend the life cycle of our assets, as well as increasing the efficiency of our operations using advanced analytics, robotics and intelligent technologies.

- Enhance current and future service standards to improve and extend asset life
- Improve workplace health and safety
- Optimise lifecycle investment decision making to enhance reliability of services
- Improve smart monitoring, sensing and proactive maintenance to improve customer service
- Intelligent tools for advanced leak detection and water conservation
- Smart demand management solutions to mitigate peak load issues





Successful & innovative business

To be a successful and innovative business, Sydney Water needs to be future-focused. Research and innovation support the business by scanning for emerging future challenges and innovative solutions while providing a mechanism to trial new technologies in a real-world setting.

Pilots and technology trials

We're investing in trailing technologies and processes in our area of operations.

An upcoming key priority is the development of a new wastewater technology and a trial facility to supplement existing pilot plants across our network.

Through W-Lab, Sydney Water collaborates with other water utilities to effectively evaluate and trial solutions for water industry challenges.

Horizon scanning

Horizon scanning and evaluation of emerging technologies through desktop reviews and technology platforms is an integral part of discovering novel approaches to our treatment and network challenges.

It also ensures that we have a more complete understanding of the implications for the business, including any pitfalls, costs and maintenance requirements before the organisation commits to full implementation.

We leverage W-Lab and other technology platforms for horizon scanning.

W-Lab is a national water industry collaboration to identify and trial emerging technologies.





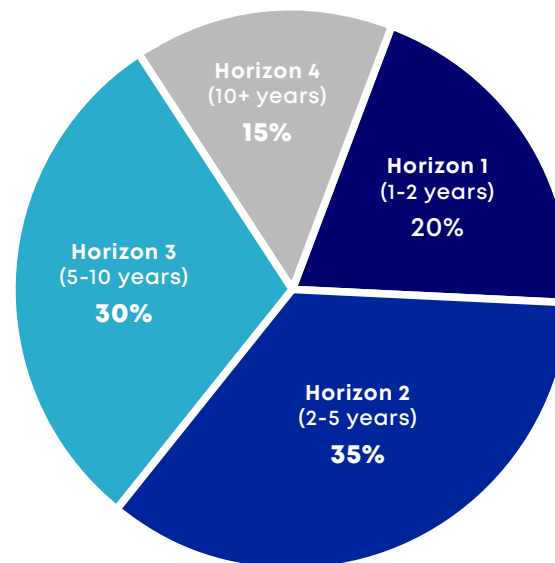
Our approach to innovation

Strategic priorities

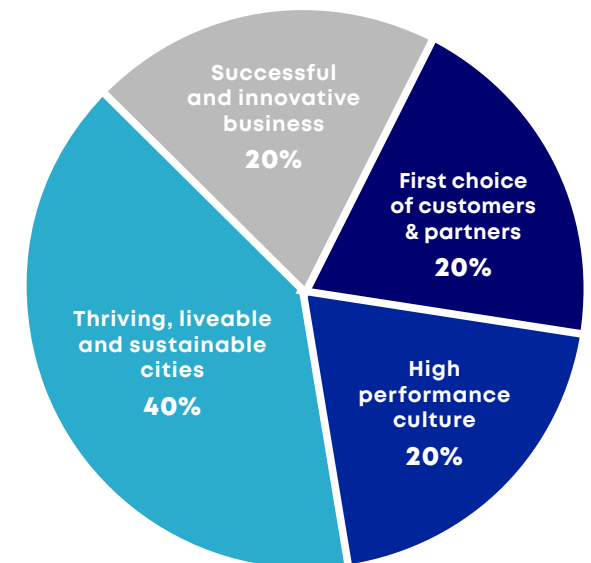
Sydney Water's R&I governance framework ensures ideas and solutions that meet our strategic business and operational outcomes are prioritised for investment. This includes opportunities to fast-track and/or leverage investment options.

We'll use a centre-led governance model for planning and investment decisions with decentralised delivery models for projects, pilots and trials across our four horizons.

**Investing our efforts
(time and money)**



**Balancing our efforts across our
strategic outcomes**

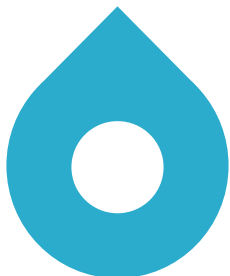


Our approach to innovation

From idea to deployment

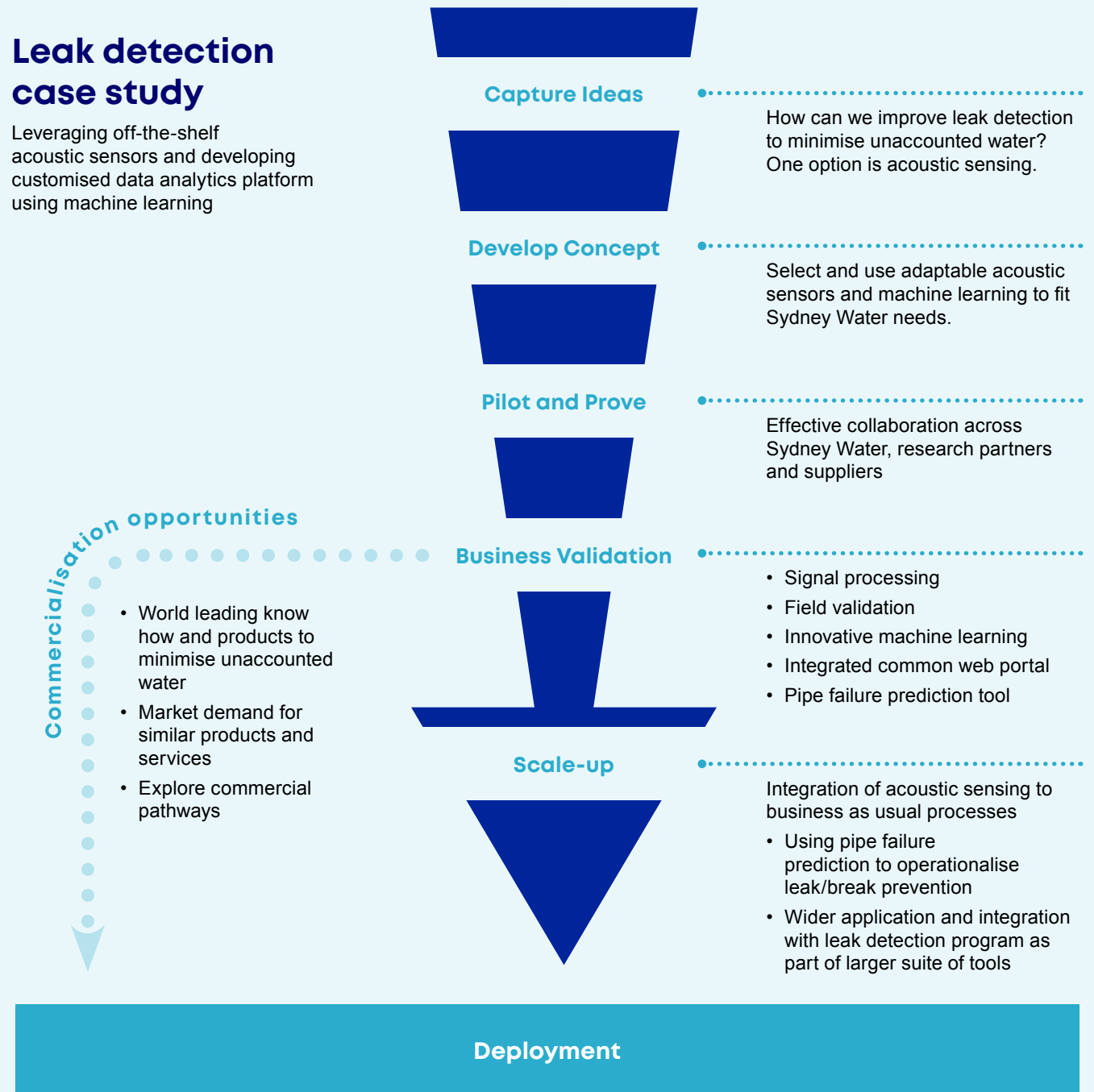
We capture ideas from across our business to identify and tackle our strategic priorities or challenges. To identify potential solutions, we'll undertake a market analysis to identify and evaluate what's commercially available. Where no product or service exists, we'll seek to co-create a fit-for-purpose solution with our partners. Sometimes, we need to use a combination of both off-the-shelf products and customised approaches to meet our specific needs.

We use commercially available technologies where possible, and when they don't exist, we'll seek to adapt or create fit-for-purpose solutions with our partners.



Leak detection case study

Leveraging off-the-shelf acoustic sensors and developing customised data analytics platform using machine learning



Our approach to innovation

From idea to deployment

Internal deployment

Our primary focus is on implementing new or improved products and services for optimising our business operations and enhancing service delivery.

Our aim is to invest in more 'applied' technology development in the range of Technology Readiness Level (TRL) 5 and above.

As required, we will deploy these solutions for our use based on:

- successful pilot trials which demonstrate business benefits
- proactive frontline staff engagement to overcome design constraints in shorter timeframes
- resourcing deployment activities including technical and operational change management.

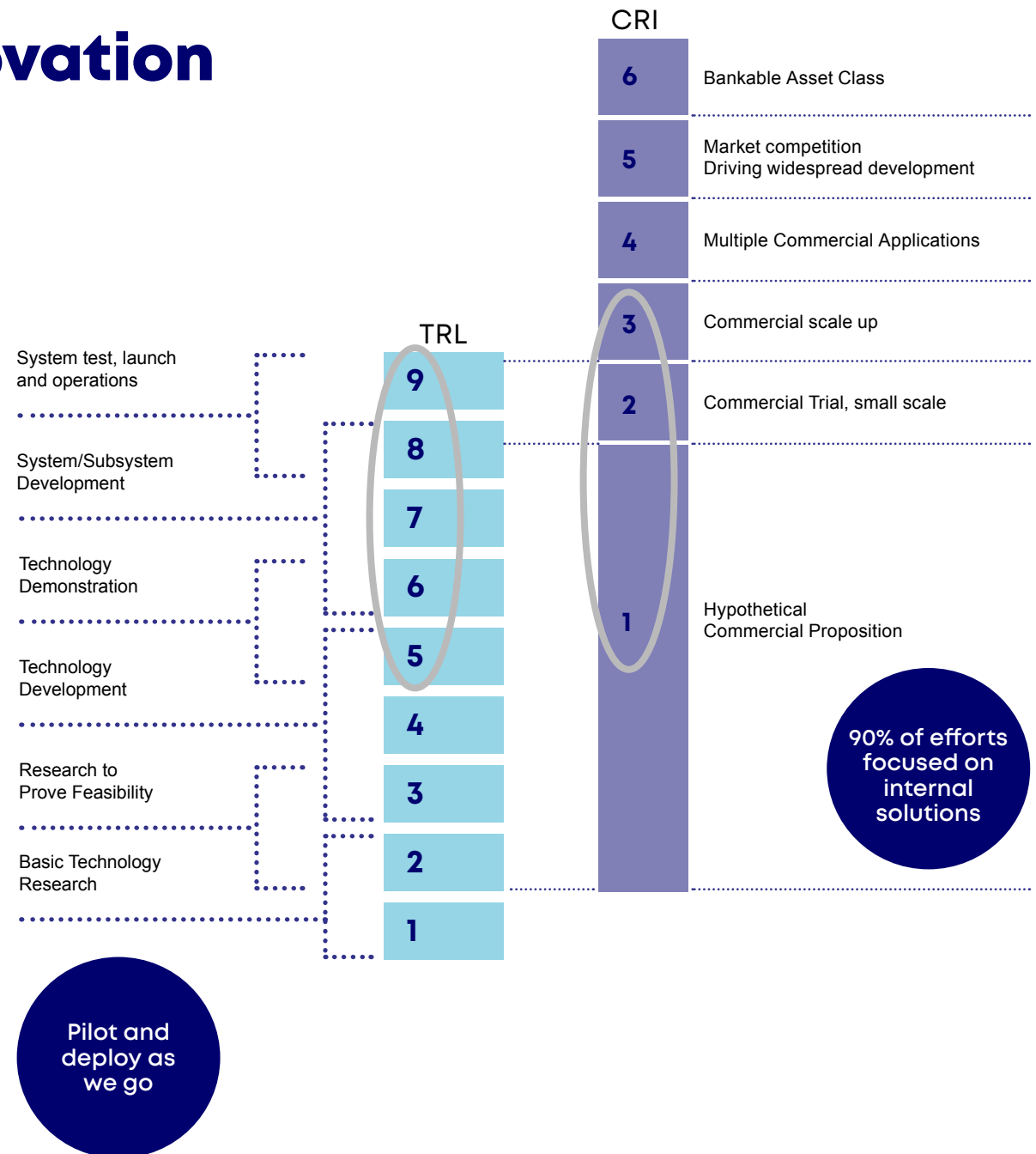
Where appropriate, we'll seek to fast-track the development of emerging technologies and solutions as they move up the TRL scale.

This will ensure they are designed to meet utility needs, not waiting until they are fully developed to reduce the timeframes and costs required to realise the benefits.

External commercialisation

Commercialisation for external markets will be considered on a case-by-case basis.

We'll explore a range of commercial models with external service providers.



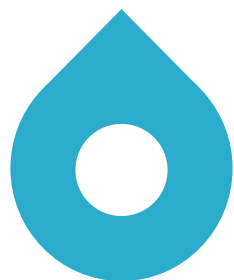
Our approach to innovation

Investment and deployment opportunities

Sydney Water's objective is to reduce the time required to evaluate, test, trial, validate and deploy new ideas and solutions, through maximising our collaboration and research investment with our partners.

'Our focus on co-creating solutions means we are looking to the market for innovative new approaches which will be key to our investment and partnership strategy going forward.'

We're open to various funding and engagement models with partners. There are also opportunities to take advantage of pilot trial sites for testing and validating technologies.



Continuing to make a difference - flagship programs

Improving liveability in our community

We're investing in research and innovation to support urban greening and cooling initiatives across Sydney.

We'll be commencing trials of other water sources for urban greening, cooling and liveability benefits. This includes assessing the impact of recycled water versus potable water for irrigation of green space, capturing stormwater for passive street tree irrigation, and improving stormwater detention and retention.

We continue to assess current and future climate risks for our assets and our communities, making our future city more liveable for our communities.

Environmental management

We're using innovation to ensure Sydney Water meets its environmental regulatory requirements. We're developing and trialling a range of ways to prevent wastewater leakage and overflow into the environment. From our sewer pipe condition assessment robots to AI detection of sewer chokes, to photonic sensing for asset structural health, we're using smarter technology to help protect our environment.



Technology and pilot trial facility

We're making it easier to trial new innovations.

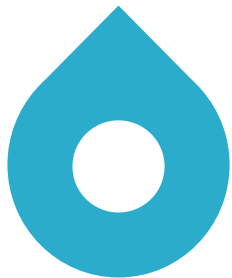
As part of our R&I pipeline from idea to implementation it's essential to pilot new technologies and processes to see if they'll work in the field.

We're developing a wastewater technology and pilot trial facility to give ourselves and our partners a space where we can trial innovations in a safe to fail environment.

Saving water

We're focusing on water conservation – during and outside of drought.

Even when our dams are full, we need to make sure we're saving water where we can. Our Water Conservation Innovation Fund dedicates R&I funding towards new ways of reducing our water use. These include using IOT and acoustic sensing to detect leaks, smart water devices in the home, and using data and analytics to gain insights into water usage.



Open to opportunities

For further information or to discuss innovation, research and deployment partnership opportunities, please contact the Research team:

research@sydneywater.com.au



Sydney
WATER