WATER INFRASTRUCTURE

Smartcrete Pathway to Concrete Research

25th March 2022
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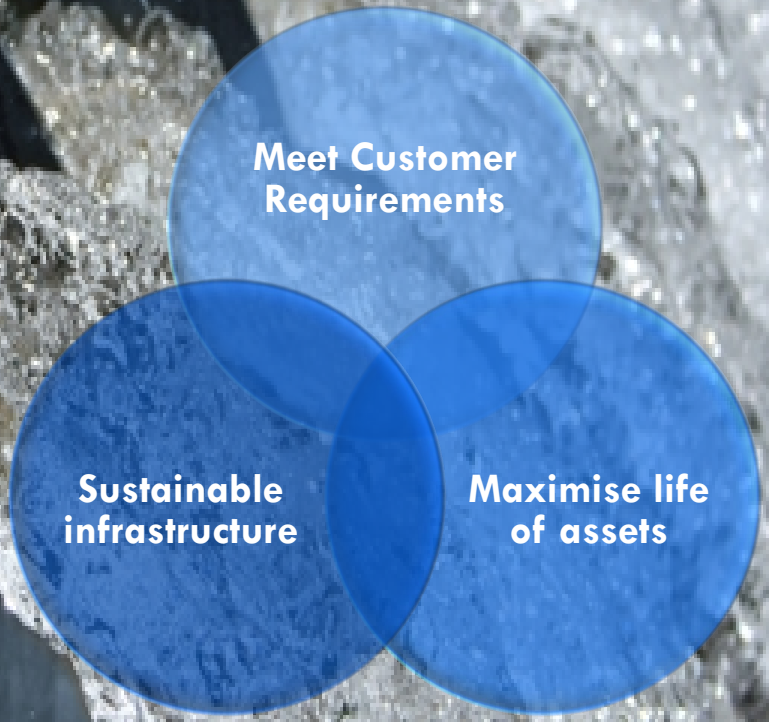
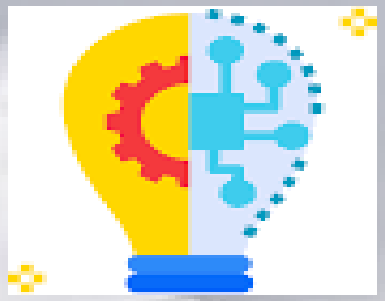
Outline

- Research
- Facilities
- Highlighted Industry Projects
- Industry Partnerships
- Community of Practice

Water industries aim to provide affordable and reliable services and maintaining the trust of customers



Challenges and Opportunities



Emerging Technologies

Ageing Assets, hard to access and extensive

Rising Cost

Climate Change

Population Growth

Investment constraints

Water-infrastructure Research@ USYD
Faculty of Engineering

- Decision Tools
- Material Performance and Failure Assessment
- Condition Assessment
- System Rehabilitation
- Economic Modelling and Business Risk Assessment
- Sustainability/Circular Economy

Sewer Rehabilitation & Prioritisation Decision Platform

This was developed by The University of Sydney and is designed to assist asset managers, project managers and liner installers by:

- Prioritising concrete assets for rehabilitation
- Selecting coating that will work in the sewer's environmental conditions based on sewer classification
- Determining required coating thickness for required service life for a given sewer classification

See https://water360.com.au/projects/smart-linings/wastewater-liners/

Failure Assessment

Utilising our knowledge of processing engineering, material science, and other basic sciences to understand the root ***causes***, ***mechanisms*** and ***consequences*** of material failure.

- MICC
- Soil Corrosion
- Chemical Corrosion
- Pressure Transients
- Tribocorrosion

Material Performance

We provide/support accelerated lab-scale to protocols for field testing in ‘live’ assets

Digital Asset Management Solutions (USYD EIE)

AI

On-edge: Local
Immediate detection
Mono/bi variable

On-cloud: remote
Delayed reaction
Multi-variables

AI & IoT (AIoT) Asset Management Platform

AWS/Alibaba/edge cloud supported AIoT platform for asset management

AI, Machine Learning and Digital Twin Modelling

- Extensive AI and Machine learning expertise in various applications.

- Developed digital twin modelling for various applications

Network connectivity

Terrestrial 6G, satellite networks, 6G intelligent IoT connectivity and security, Industrial IoT, local and wide area networks

Wireless Sensing

Strong expertise in radio sensing/radar imaging, quantum sensing, wireless sensor networks/IoT

Smart Health AIoT

– An AIoT system based on LORAWAN and AWS cloud for personnel tracking, people counting, asset management, environment monitoring.

System Rehabilitation

- Coating Selection
- Placement
- Surface Preparation
- Design of Protective System
- Economic Analysis and Business Risk Assessment
- Regulatory Framework

Protective Coatings Manual

WSA 201:2020 Manual for Selection and Application of Protective Coatings Version 2.3

WSAA's manual for selection and application of protective coatings has been updated with the findings from the field trials and University of Sydney testing and includes new information on

- Corrosion Classifications
- CAC and Geopolymer system requirements
- Surface Preparation
- Repair Requirements
- Application Requirements
- Defects
- Quality Assurance
- Acceptance Testing

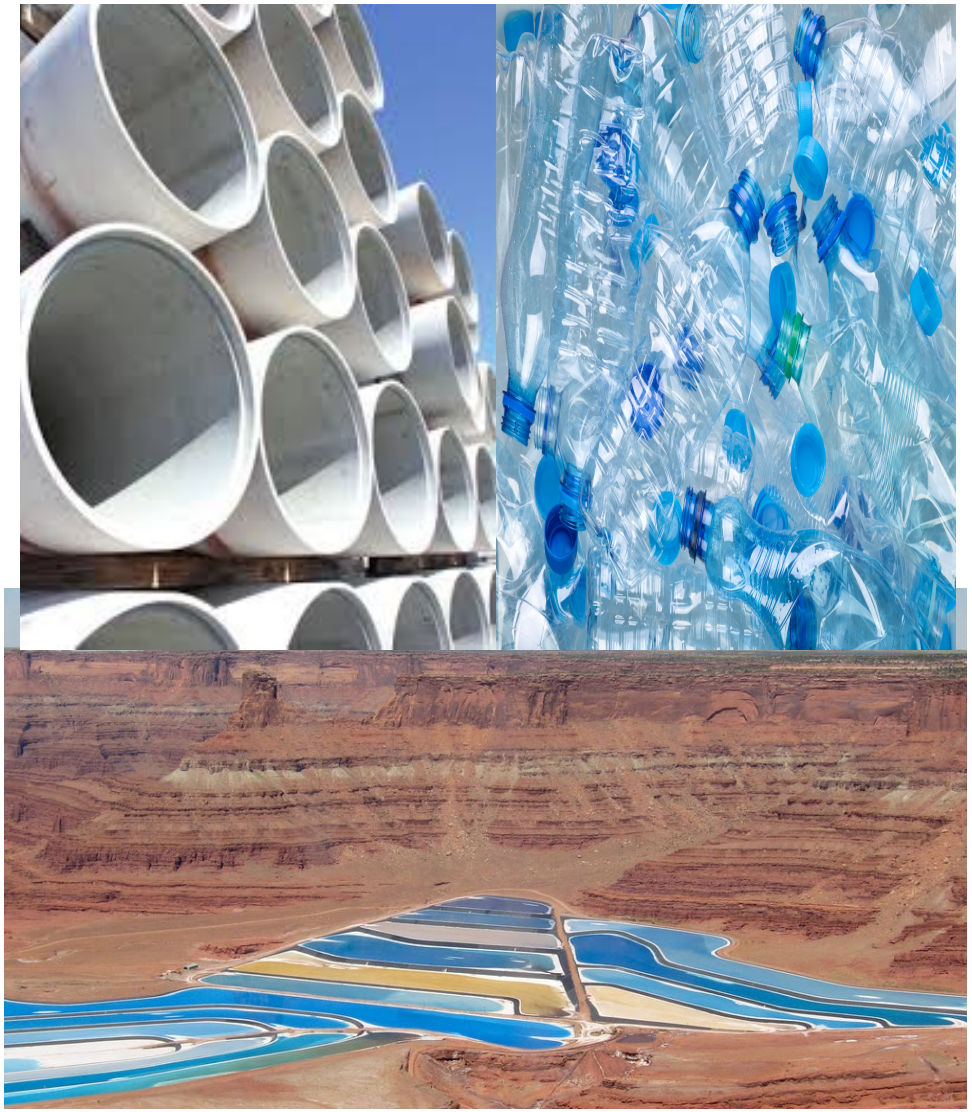
Sustainability/Circular Economy

Support the water industry through material selection to support decarbonisation

Developed **National and Utility Specific Product Specifications** e.g.,:

- geopolymer and alkali activated cement mortars (WSA 161-2021 V1.0)
- Repurposed waste in specialty cement mortars (WSA 160-2021 V1.0)

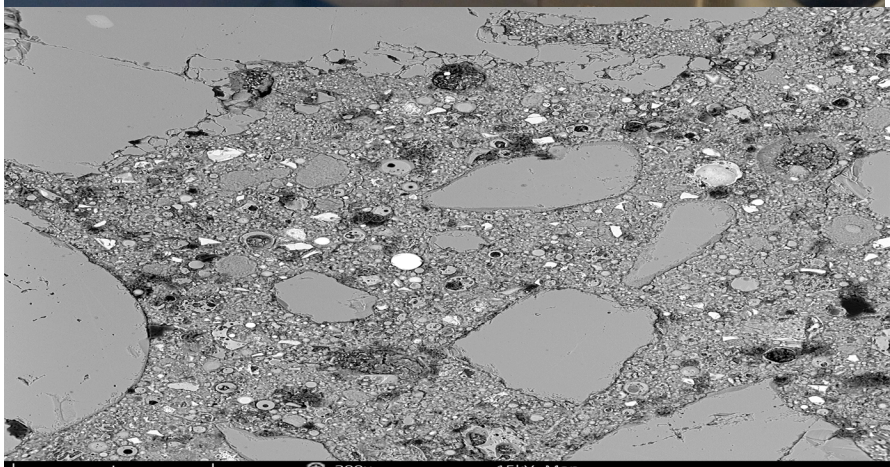
Compliance testing e.g., geopolymer concrete for construction of composite sewer pipes (Interceptor project, Watercare)

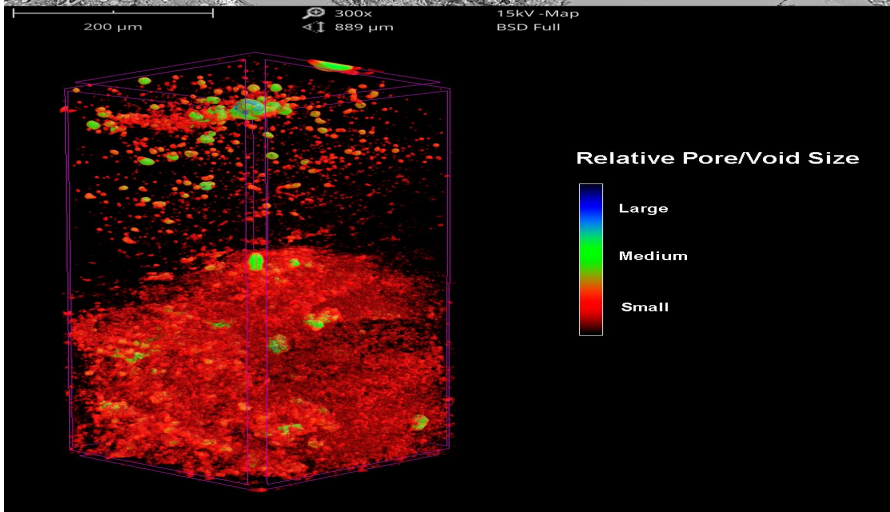


Sydney Core Research Facilities

State-of-the-art instruments and technical expertise for sample characterisation permitting exploration of physical and biological structures at the macro, micro, nano and atomic scales

- Sydney Analytical
- Sydney Microscopy & Microanalysis
- Sydney Manufacturing Hub
- Sydney Mass Spectrometry





Highlighted Projects (e.g.,)

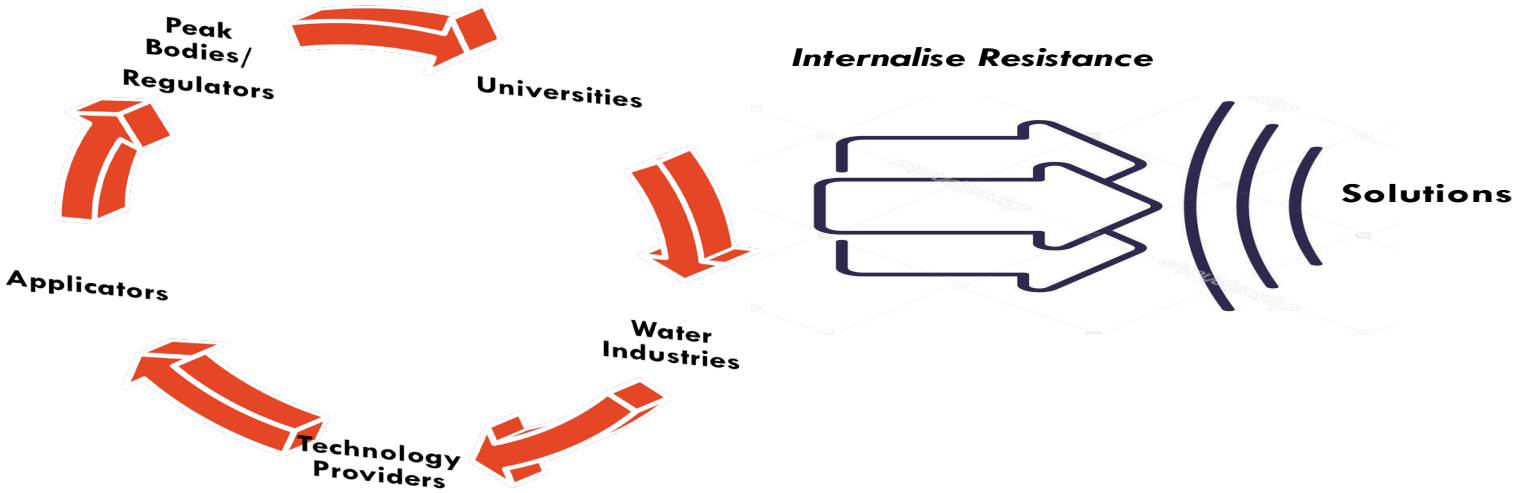
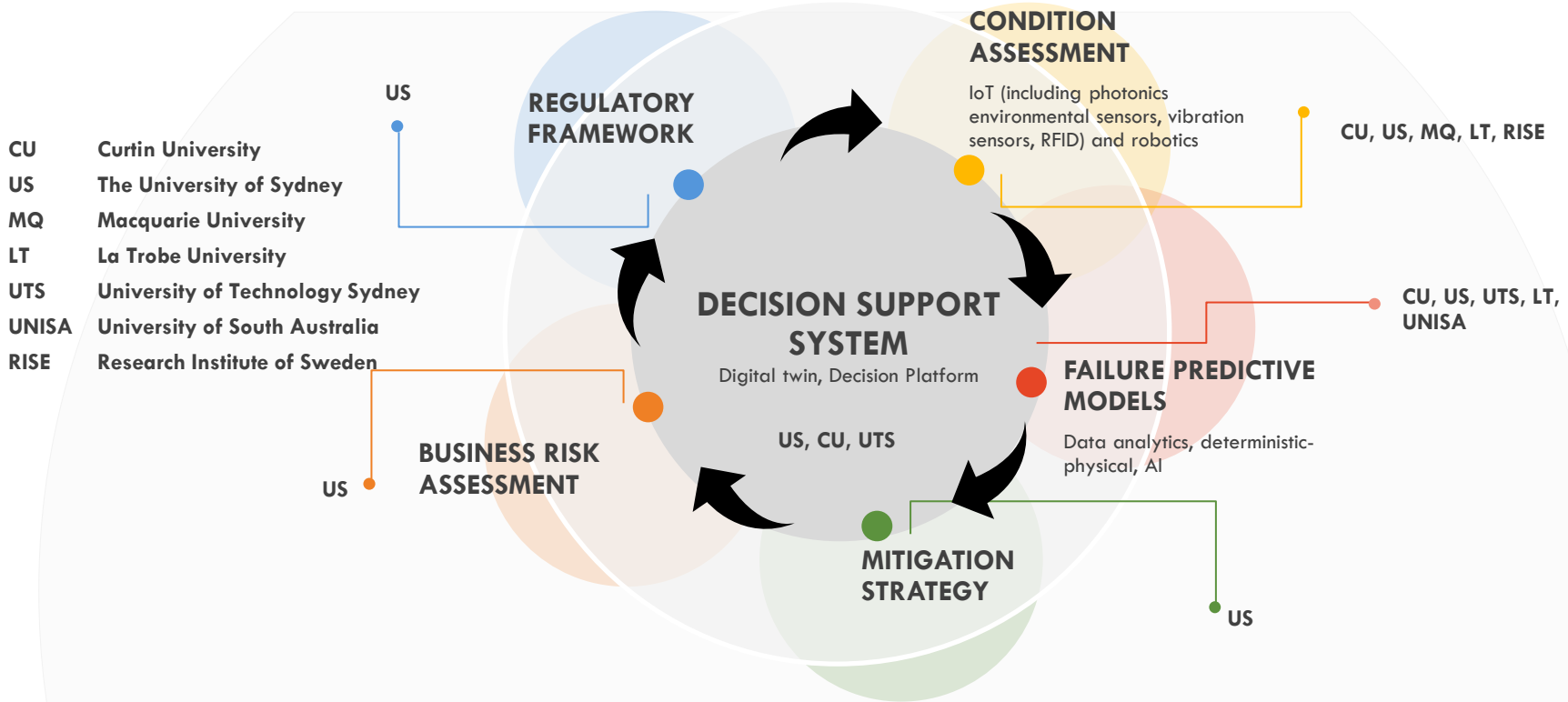
CRC-P
SMART LININGS FOR PIPE & INFRASTRUCTURE 2018-2022

Delivered clarity on water asset rehabilitation needs, decision tools including sewer classification, failure predictive models, pipe prioritisation and mitigation selection/design, specifications and standards to meet water industry requirements to manage $160B of assets

$25M+ project with 35 industrial (utilities and manufacturers) partners including WaterRF, WERF and UKWIR.

See **Water360** website:
https://water360.com.au/projects/smart-linings/

Industry Partnerships



Community of Practice in Water Infrastructure Asset Management (Smartcrete)