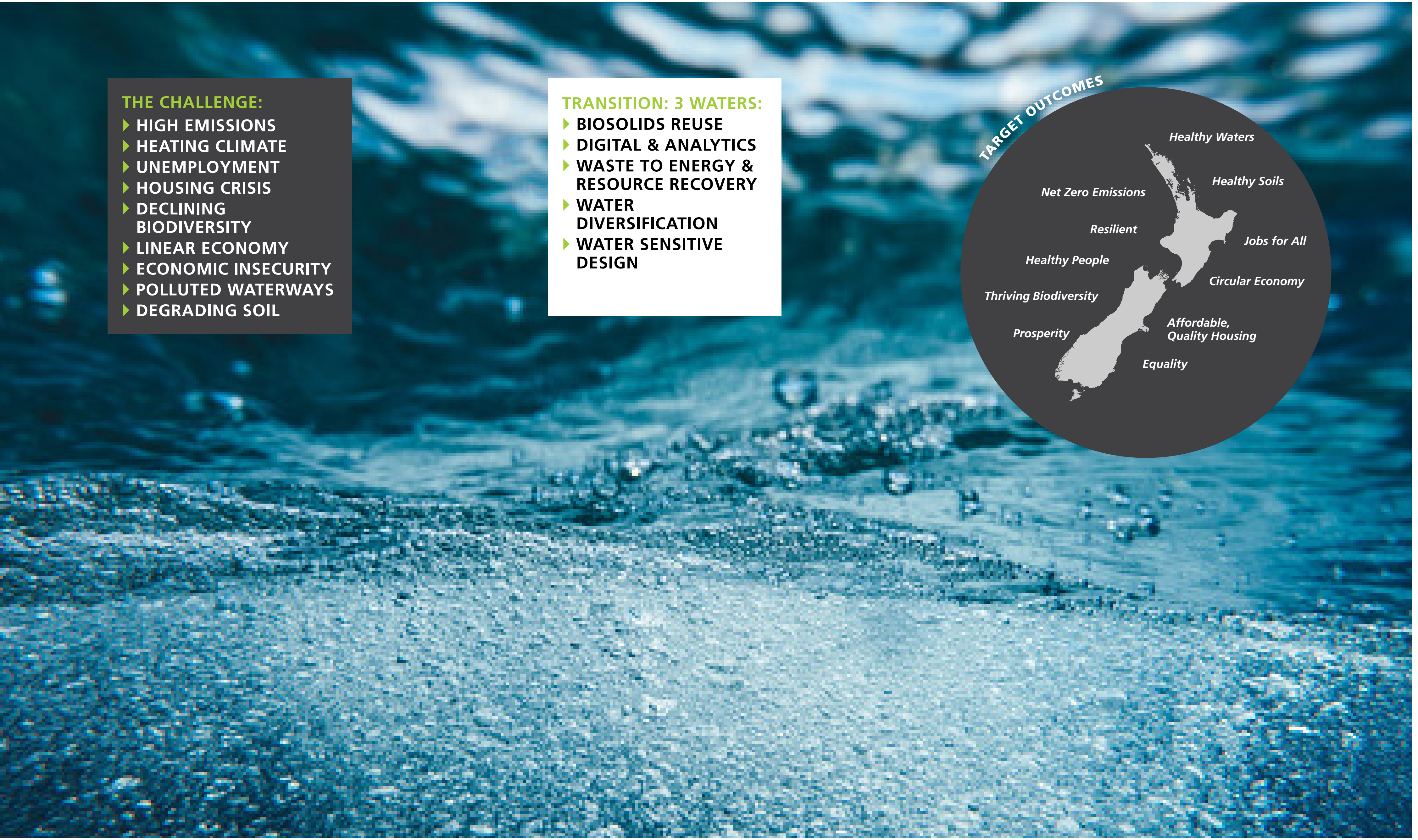

Transition: Three Waters Systems

CHALLENGE STATEMENT

Clean and healthy waters are essential to wellbeing, provide vital habitats and are areas of cultural significance and cherished recreation. Water use, treatment and disposal contribute to greenhouse gas (GHG) emissions and can have a significant environmental impact on land and water bodies through source pressure, contaminant loading and waste production. Many smaller communities do not have the rate base to afford enhanced water quality and wastewater treatment. Key sources of emissions include biogas and biosolids from wastewater as well as the emissions from the construction and operation of water assets. Key climate risks relating to our water systems include drought (reducing supply), floods (damaging local ecosystems and contaminating waterways), and major storm effects (damaging water assets).

KEY OPPORTUNITIES

Beca water specialists have identified key opportunities for transitions in the water system during the Wave 3 recovery as:

Biosolids reuse: In New Zealand, 90% of biosolids are sent to landfill. Projects that focus on biosolids reuse will reduce GHG emissions and cost associated with sludge disposal, which can contribute to 90% of total treatment plant Scope 3 emissions, by offsetting fertiliser application to land, thereby reducing nitrous oxide (N_2O) emissions from nitrogen-based fertilisers. Investments in R&D projects on post-processing will create high value jobs and help to maximise fertiliser value. Investments in biochar projects will improve land productivity and absorb contaminants by use of biochar (land revegetation and rehabilitation). Benefits include displacement of non-renewable nutrient use and carbon sequestration.

Asset data digital sensing and analytics: Investment in digital sensors and data capture systems and R&D funding into implementation strategy will create high-value employment and proved a range of environmental benefits. Active control of biological wastewater treatment processes can minimise both process and effluent N_2O emissions. Enhanced control of water and wastewater treatment increases efficiency and improves water recovery. Efficient process control reduces N_2O emissions, presenting significant GHG reduction benefits since N_2O is 300 times more potent than carbon dioxide (CO_2) for atmospheric warming.

Waste to energy and resource recovery: Biogas capture in municipal wastewater treatment reduces process emissions and offsets power requirements for the plant (can generate >100% of a plant's electricity demand). This involves lower infrastructure costs as most of the facilities are already operating. Projects that facilitate capture of residential food waste within the wastewater system support additional useful biogas generation at treatment plants. Projects promoting nutrient capture such as struvite recovery from wastewater provide a phosphorus source, offsetting non-renewable phosphorus mining. Industrial wastewater to energy should be considered in the longer term but is not a priority in the Wave-3 recovery.

Water storage, supply and treatment diversification: Investment in water storage projects; with appropriate storage of harvested water collected during wet weather and high flows, can support productive land (irrigation for agriculture to protect the rural economy), provide potable water for our urban and rural systems and significantly improve drought resilience.

Projects that provide indirect potable reuse of wastewater or non-potable reuse through "purple pipe" systems, help to close the water and wastewater loop. Benefits to communities include reliable water to supply green spaces and recreational areas. Indirect potable reuse is difficult to retrofit to existing urban areas; public perception and health-based stakeholder support will require rigorous risk management and a multibarrier approach to pathogen reduction. Projects that improve internal water recycling within wet industry (pulp and paper, dairy) through onsite wastewater recovery have benefits including reducing water scarcity pressure and reduction in wastewater discharges to the environment. Economic viability for industrial water recycling requires a high level of capital investment and may require a legislative driver to create this shift.

Roadmaps for water sensitive design: Investment in R&D and development of roadmaps for water sensitive design should be prioritised. These should focus on improved stormwater recycling or treatment prior to discharge to reduce contaminants going rivers and the ocean and the use of green infrastructure to provide climate change adaptation and flood relief.