Te Tauāki Koronga Mahi 2022–2027

Statement of Corporate Intent

ESR
Science for Communities
He Pūtaiao, He Tāngata

He Pūtaiao, He Tāngata

Impact for Māori / Mātauranga Māori

Tautohua
DETECT

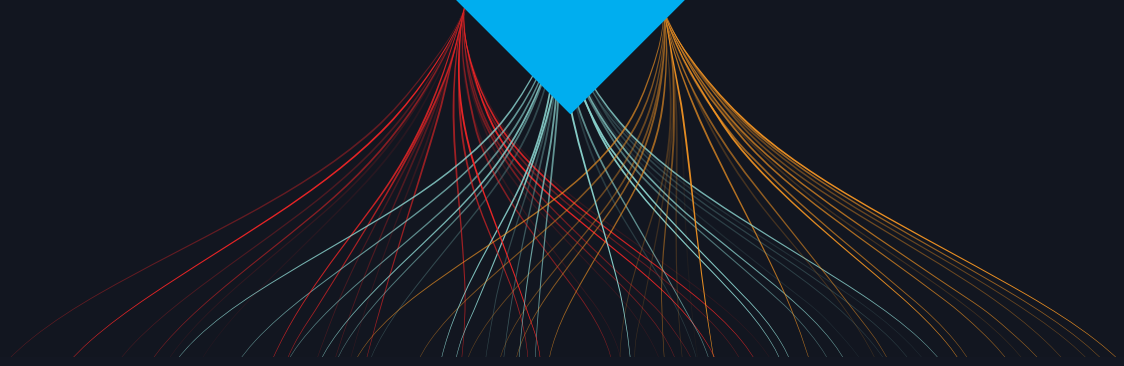
IDENTIFY emerging issues by recognising the interconnection between people, animals, plants and their shared environment

Tiakina
PROTECT

KEEPING communities healthy and safe by delivering comprehensive and connected wellbeing outcomes

Tūhonotia
CONNECT

PARTNERSHIPS that facilitate a whole system approach to wellbeing



Te nanao atu ki te hōhonutanga o ō tātou mōhiotanga kia whai mōhio ai ā tātou whakatau mō te haumarutanga me te oranga o ngā tāngata katoa o Aotearoa.

Drawing on our depth of expertise to inform better decisions for the safety and wellbeing of all New Zealanders

ESR provides science leadership to improve the wellbeing of communities

We are the Crown research institute that plays a critical national role in public health and forensics, and a key contributor to environment and biosecurity outcomes. The services we provide through combining and applying expertise from our rich array of health, forensic, food, water and radiation sciences allows communities to thrive and prosper.

Our aspiration is that, through innovative science, ESR is at the forefront of attaining the lowest possible burden of crime, environmental contamination and infectious diseases in New Zealand. Reducing inequities and improving wellbeing outcomes now and for the future are at the centre of ESR's thinking.

As a science leader in Aotearoa New Zealand, we recognise that mātauranga, science and research solutions are enabled by equally valuing Māori knowledge and science to increase the wellbeing of communities and the environment. We aspire to be acknowledged as a place where mātauranga thrives alongside science, and Māori-led and co-designed research generates lasting partnerships through increased cultural capability and capacity. ESR is a leader in identifying infectious diseases and developing solutions to protect the people of New Zealand. We strengthen New Zealand's pandemic and infectious disease preparedness and contribution to global pandemic readiness.

We provide **world-class genomics science** for the benefit of people and the economy in the areas of wastewater testing, food genomics, antimicrobial resistance, COVID-19 and infectious disease.

We provide **cutting edge forensic science analysis and toolkits** to support fairness and equity in the justice system. We deliver the science and toolkits to remove drug harm from our communities and improve justice outcomes.

We provide the science that **detects and eliminates contamination to water and food** to ensure healthy wai and kai.

ESR's applied expertise lies in the conjunction of detecting, connecting and protecting, and our strength is to foresee future challenges and the potential solutions and to scale up capabilities across public health, forensic and environmental science areas. Our approach recognises the value of **recombinant**, **cross-sectoral and transdisciplinary** skills, and their importance in the development of comprehensive solutions.

ESR provides research-led science delivery and invests in science solutions for current and future challenges. We are actively investing in mātauranga-led solutions alongside our science capabilities to inform, learn, develop and implement the solutions for the public health, environment and community wellbeing challenges of today, tomorrow and for the future.

We are ESR.

Ngā kai o roto
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Presented to the House of Representatives pursuant to section 16 of the Crown Research Institutes Act 1992.

The Institute of Environmental Science and Research Limited (ESR) is a Crown research institute. It was incorporated in June 1992 and is wholly owned by the New Zealand Government. The two shareholding Ministers appoint a Board of Directors to govern the organisation. ESR has science facilities in Auckland, Wellington (Porirua and Wallaceville) and Christchurch.

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He kupu nā te Heamana / Tumuaki /

Chair and Chief Executive's overview

We are pleased to present ESR's Statement of Corporate Intent for 2022–2027. Research-led science delivery for improved community health and wellbeing is at the heart of everything ESR does.

Our aspiration is that ESR builds on its growing reputation to become one of the foremost renowned science institutions in the world. This will contribute to attaining the lowest possible burden of crime, environmental contamination and infectious diseases in New Zealand. An integral part of pursuing our vision is that ESR is a Crown research institute where mātauranga thrives alongside applied science research and delivery. This will generate uniquely Aotearoa New Zealand solutions that will effectively address current and future wellbeing and equity challenges. We will provide leadership within the science sector in championing this shift.

This Statement of Corporate Intent outlines the strategic approach, investments and opportunities ESR will pursue to achieve this aspiration.

Mātauranga-led solutions alongside science

ESR is refreshing its He Pūtaiao, He Tāngata strategy to identify the actions that will create greater space for and impact with Māori. We are building and applying science and business approaches that reflect Te Tiriti o Waitangi principles through:

- **building enduring partnerships with iwi** through mātauranga-led and mātauranga solutions alongside science
- **strengthening our leadership in co-design and co-governance with Māori** in all our areas of impact, such as infectious diseases, data sovereignty, the use of DNA, and removing contamination to wai and kai
- **creating the pathways for mātauranga expertise and Māori scientists and researchers** to flourish, to ensure the research we undertake better delivers for Aotearoa New Zealand.

We are at an early stage of this journey but we are determined to ensure that, in time, we are acknowledged as a place where mātauranga thrives alongside science – so it is in our DNA.

Positive impact through collaborative leadership

ESR will continue to build and deliver collaborative leadership to deliver effective research-led solutions to improve community wellbeing. We are actively engaged in the health and disability sector reforms, three waters reforms, and Te Ara Paerangi – Future Pathways Green Paper, which aims to reset New Zealand's research, science and innovation system for the future to contribute to systems shifts impacting community wellbeing.

ESR's approach to research-led delivery recognises the value of recombinant and transdisciplinary skills, and their importance in developing comprehensive solutions. We will build and strengthen our collaborations with universities and other research providers within Aotearoa New Zealand and internationally. ESR's successful joint bid with the University of Otago as co-hosts of the new Infectious Disease Research Platform is an opportunity to develop and deliver greater pathways for impact. This platform, co-designed and established with Māori, will equip the health and research, science, and innovation sectors to develop capability and technology that will further lift New Zealand's capability and capacity to face infectious disease outbreaks and challenges.

Our continuing international collaboration, SHIVERS research through the United States National Institute of Allergy and Infectious Diseases and the St. Jude Center of Excellence for Influenza Research and Response will continue to deliver research insights into influenza here in Aotearoa and internationally.

ESR is also actively pursuing, with the University of Auckland, the development of a joint graduate school. This focuses on collaborative student research, teaching and secondment opportunities initially in forensics with the intention to explore expanding into health, water and food-borne disease sciences.

ESR's collaboration with the New Zealand Police through a strategic governance group aims to develop new innovative solutions to help remove community harm and address inequities in the justice system. Lumi™ developed by ESR scientists will be a gamechanger for community policing and the prevention of harm from drugs. We are working with OSPRI (Operational Solutions for Primary Industries) to provide an 'at the farm gate' tool to significantly reduce the diagnostic time for tuberculosis.

ESR continues to work closely with Ngāti Toa Rangatira at Kenepuru in offering community youth outreach activities, co-designed research initiatives, employment opportunities for local iwi scientists, and close collaboration on the development of ESR's build design on its Kenepuru site.

These and many other collaborations enhance ESR's contribution to lessening the impact of disease, environmental contamination, and justice inequalities on community wellbeing here and around the world.

Investment and focus for the future

ESR's investment in future-focused research programs and world-leading research staff generates technologies and intelligence to address future challenges to New Zealand's wellbeing. Resilience, endurance, innovation, and flexibility will be crucial as we continue to operate in a time of uncertainty and change.

With New Zealand's borders opening, ESR is committed to providing future insight by helping ensure New Zealand's health surveillance and laboratory IT systems support enhanced genomic and epidemiological surveillance for COVID-19 and emerging infectious diseases, including antimicrobial resistance.

ESR is expanding its investment in mātauranga Māori, the science capabilities of environmental DNA, genomics, infectious diseases, and data science. These capabilities will be underpinned by investment in business systems that will increase integrated decision-making across all areas of ESR's science and business while promoting better collaboration internally and externally. Together with GNS Science, we are implementing a new business platform – Workday – for managing our financial and human resource activities to drive business efficiencies that will improve resilience and responsiveness.

ESR is taking a systems-thinking leadership approach to genomics by generating whole-genome sequencing with and for the food industry that offers new insights for improving food safety. We are also working to establish a secure genomics database and platform for storing the genomic sequences of bacterial pathogens of interest. This important database will be key for providing insights and intelligence to support further research and future health and environment regulatory functions.

Community connection is important. ESR believes that, as a science and mātauranga research-led delivery institute focused on improving community outcomes, it is important to be located in the communities where its research delivers impact. The modernisation of the Kenepuru Science Centre is crucial to allowing our scientists access to modern facilities, as well as making the facility and its science accessible to co-creation and co-learning with local communities, especially local iwi. An iconic building co-designed with Ngāti Toa Rangatira, groundwaork geo-technics and the granting of resource consent by Porirua City Council are all completed.

ESR will continue to prepare for the challenges that will face Aotearoa New Zealand communities through its forward-looking applied science and mātauranga Māori-led research and delivery approach.

We look forward to continuing and growing our collaboration with iwi, the Government, and partners to deliver on the purpose and intent outlined in this SCI.

Denise Church QSO **Chair**

Peter Lennox **Chief Executive Officer**

Ko te whakatinana i tā mātau rautaki /

Delivering our strategy

We will continue expanding ESR's thought leadership through strategic, integrated investment in our relationships, workforce, mātauranga and advanced science capabilities and systems. This investment aims to maximise national and international opportunities to further elevate ESR's performance and will help us achieve shifts in inequities by delivering more for New Zealand's people and environment.

Our aspiration is that ESR creates and delivers transformational science using mātauranga and science. This will help to deliver solutions for communities that will attain the lowest possible burden of crime, environmental contamination and infectious diseases in New Zealand.

ESR's strategic objectives highlight the shifts ESR is making to deliver on this future through:

- **integrating thought leadership** in mātauranga and applied science research. We will continue to grow new areas of research by leveraging our capabilities in mātauranga across our science disciplines. This will close knowledge gaps and expand our opportunities to increase frontline responsiveness
- **demonstrating our commitment to Māori and Te Tiriti o Waitangi** by resourcing and increasing our funding in co-designed, Māori-led research programmes and services that deliver long-term increased impact with and for Māori communities
- **creating a thriving organisational culture** that is diverse and inclusive by reflecting Aotearoa New Zealand, and provides people-centred leadership and opportunities for staff growth that will shape and expand ESR's science capabilities
- **developing strategic and long-term sustainable partnerships** to extend our research capacity and ability to prioritise and shape our science, putting our customers at the heart of what we do. The smarter alignment of mutual strategic goals and sector priorities will deliver increasing long-term benefit
- **re-shaping ESR's science** by building increased capability and capacity in **environmental DNA (eDNA), infectious diseases and climate change health response**, **data science**, and **genomics** capabilities. ESR's integrated science approaches and investment in dynamic workforce capabilities will help ensure relevance, resilience and adaptability
- **maximising opportunities for smart and targeted investment in science capabilities and electronic infrastructure** (e-infrastructure) that will expand ESR's computational science and data pipelines
- **strengthening business systems and processes** to allow greater responsiveness to our stakeholders and partners.

Maarire Brunning Kouka, Kaitiaki mō Te Runanga o Toa Rangatira, working with ESR to collect shellfish at Porirua Harbour.

Photo: Donna Warren, Ngāti Toa Rangatira, KSC

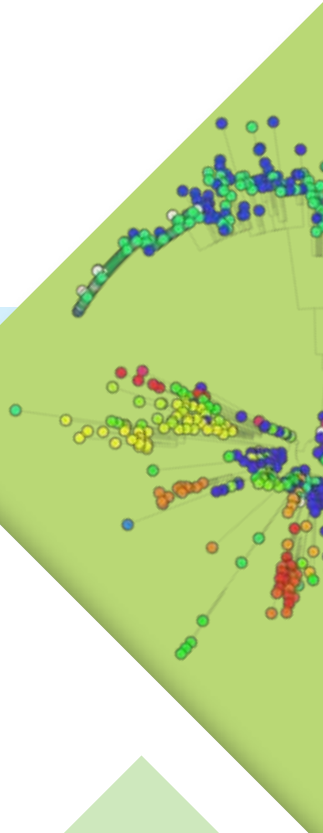
Whāinga rautaki / Strategic intent

Ko tō mātau moemoeā / Our vision

ESR is at the forefront of attaining the lowest burden of crime, environmental contamination and infectious diseases in New Zealand.

Ko tā mātau kaupapa / Our purpose

ESR protects and enhances the wellbeing of people living in New Zealand.



ESR
Science for Communities
He Pūtaiao, He Tāngata

Core science capabilities

- Genomics-first approach
- Communities interaction – social science approach
- Integrating digital research through data science for applied intelligence
- Water and food contamination detection and solutions
- Public health surveillance and solutions: infectious diseases, drug harm and radiation safety
- Forensic science analysis and solutions

Tautohua
DETECT
IDENTIFY emerging issues by recognising the interconnection between people, animals, plants and their shared environment

Tūhonotia
CONNECT
PARTNERSHIPS that facilitate a whole system approach to wellbeing

Tiakina
PROTECT
KEEPING communities healthy and safe by delivering comprehensive and connected wellbeing outcomes

Impact for Māori
Mātauranga Māori

We INNOVATE

- by **shaping the future** of our science
- by **building stronger foundations**

We COLLABORATE

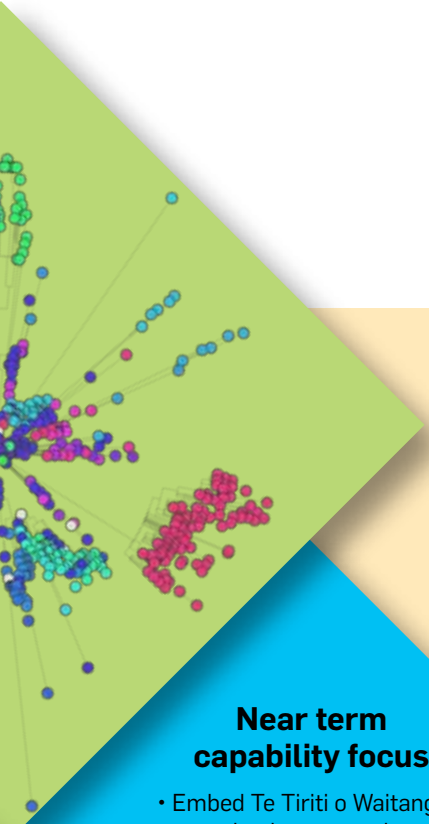
- by **detecting** and **identifying** emerging and complex issues using holistic approaches to innovate and deliver increasing value and impact for communities
- by **connecting** to create shared goals and **collaborating** using the best applied science, mātauranga Māori and resources to find and develop community-driven solutions

We CREATE
Mātauranga and science pathways to impact:

- healthier communities
- safer communities
- cleaner water and environment
- safer food.

We ELEVATE

- by **investing** in our team: **people**, infrastructure and capabilities
- by lifting our performance to impact, we **protect** New Zealand's people to build healthy and vibrant communities and a resilient economy



Near term capability focus

- Embed Te Tiriti o Waitangi in business practice
- Value and support mātauranga knowledge systems
- Build enduring partnerships with iwi, hapū and Māori communities to realise material beneficial impacts
- Deliver a world-class science facility in partnership with Ngāti Toa Rangatira
- Invest in our world-class scientists
- Maximise the value of our recombinant, cross-sectoral and transdisciplinary skills

ESR's science focus for the near term

To continue growing our thought leadership and community-driven innovation to strengthen frontline responsiveness and interactions between the human health, justice and environment sectors to improve wellbeing.

Using holistic approaches, applied science and mātauranga Māori, we will:

- continue to provide the applied science research-led delivery to inform responses to the Covid-19 pandemic
- strengthen New Zealand's public health responsiveness and resilience to manage current and future health threats by delivering robust and innovative public health solutions and surveillance
- blend our expertise and capability with enabling technology to further drive public health innovation and support the transformation of the health and disability system
- deliver innovative tools and processes to reduce drug harm and elevate forensic science analysis to reduce community harm
- develop systems thinking approaches and solutions to climate-related risks, including emergent infectious diseases; and food- and water-borne contaminants
- expand ESR's genomics capability and capacity for greater pathways to impact
- continue expanding initiatives with current and new partners to deliver impact for communities.

Through:

- research-led science using mātauranga and recombinant, cross-sectoral and transdisciplinary skills
- solutions-focused science using systems thinking
- genomics for health, food and the environment
- shaping and supporting sector and regulatory priorities.

Healthy communities

Safe communities

Clean water and environment

Safe food

Ko tō mātau horopaki pūtaiao me te taiao whakahaere /

Our science context and operating environment

ESR's impact lies in understanding the complex connections and interactions between people and the physical and social environments to identify new or emerging issues.

Photo: Maria J Gutierrez-Gines

Introduction

ESR takes a strategic and holistic view to shift wellbeing barriers that cause health, societal and environmental harm and inequities in communities. The investments we make in our people, capabilities, data and systems are vital to elevating and expanding our **thought leadership**, **foresight and frontline responsiveness**. We are promoting greater collaboration, growing sustainable, long-term partnerships with and for Māori and building organisational cultural capability and capacity.

Through multi-disciplinary, integrated approaches, we elevate ESR's science capabilities and influence to continuously improve how we **detect**, **connect and protect** by developing solutions that are responsive to current and emerging issues.

We are building on the leadership and lessons learned in responding to COVID-19, applying and combining our science capabilities and mātauranga Māori in integrated approaches to public health, forensics, radiation detection, water and the environment. This will enable us to enhance frontline responsiveness to improve human and environmental health and contribute to a fair and equitable justice system.

Government reforms and priorities

Four significant reforms will impact on and shape ESR's future and operating environment.

At the time of developing this Statement of Corporate Intent, the Government is considering submissions on **Te Ara Paerangi – Future Pathways Green Paper**, which aims to reset New Zealand's research, science and innovation system for the future. The review explores how best to make the significant shifts needed for delivering greater impact across the science sector.

New Zealand's reformed **health and disability system** operating model comes into effect on 01 July 2022. ESR's expertise is informing discussions on the Public Health Laboratory Science system strategy involving the Public Health Agency, Māori Health Authority and Health New Zealand.

The **Three Waters Reform Programme** aims to significantly change how drinking water, stormwater and wastewater are regulated and managed. The four new water regulatory bodies being established under the programme take effect from July 2024. ESR's expertise in water contamination is helping inform the new regulatory framework.

The research, science and innovation property programme review led by the Ministry of Business, Innovation and Employment has potential implications for the redevelopment of our Kenepuru Science Centre. As a research-led delivery institute focused on improving community wellbeing and reducing harm, ESR benefits from being located within the communities where its science has direct benefits and impact. We have completed the co-design work for an iconic building with Ngāti Toa Rangatira, groundwork geotechnics, and the resource consent has been granted by Porirua City Council.

Climate change and sustainability

ESR's research and applied intelligence will further inform understanding of the impacts from climate change focusing on:

- the risks from climate-sensitive infectious diseases
- the social and cultural impacts of climate change
- the effects of climate-related risks on health systems and critical infrastructures, such as wastewater and drinking water.

We are working on developing ESR's sustainability initiatives, and we are participating in a pan-CRI initiative to reduce carbon emissions that will progress the goals of the Government's Carbon Neutral Programme.

ESR's commitment to greater impact for Māori

ESR recognises that research must be relevant and inclusive, to be of benefit to Māori, and is working to achieve this through:

- establishing partnerships with iwi to co-design and implement a portfolio of Māori-led research
- supporting and resourcing long-term Māori-led research programmes, such as He Wai Māpuna

- recognising and valuing the benefits of mātauranga to our research
- intentionally and actively recruiting for mātauranga capability
- seeking equitable solutions
- striving to be a good Te Tiriti o Waitangi partner.

We are working with our Māori partners to determine how to best support greater impact for Māori.

ESR's role in the health, justice, environment and food sectors to improve economic and wellbeing outcomes

ESR's pursuit of mātauranga and applied science research and delivery will:

- safeguard the health of New Zealanders through improvements in the management of biosecurity and threats to public health
- increase the effectiveness of forensic science for a transformed justice system
- enhance protection of New Zealand's food-based economy through the management of food safety risks associated with traded goods
- improve the safety of freshwater and groundwater resources for human use and the safer use of biowastes.

ESR's expertise and leadership to support COVID-19 response efforts have provided many opportunities to add value and impact for the benefit of New Zealand's people. ESR's early investment in genomics and wastewater epidemiology provided science-ready capability to support the pandemic response. ESR's wastewater epidemiology science was first developed for environmental monitoring, expanded to test for illicit and licit drugs in wastewater, before being used to provide public health officials with another epidemiological and genomics tool to detect SARS-CoV-2 and support COVID-19 public health response efforts. This ability to elevate ESR's science capabilities and influence demonstrates its capabilities as an innovative thought leader in research-led science delivery.

ESR's national reference laboratories play a crucial role as centres of expertise in infectious disease surveillance and time-critical diagnostic capability to identify pathogens of interest. To further improve public health surveillance and increase disease response readiness, work is under way to develop a central hub of health intelligence to inform public health responses.

The Infectious Disease Research Platform we are co-hosting with the University of Otago is a ground-breaking opportunity to influence health outcomes and wellbeing more directly. The platform will be co-designed and established with Māori. The objectives of the Infectious Disease Research Platform are to further strengthen New Zealand's resilience and management of current and future pandemics and health threats (such as zoonotic diseases, emerging respiratory illnesses and antimicrobial resistance).

We take a system's thinking approach to deliver on government and sector priorities for the benefit of New Zealand, working to integrate genomics. An example of this is our work with the New Zealand Food Safety Science and Research Centre on a project to assemble a database of whole-genome sequence data from *Listeria* bacteria isolated from human cases and other sources in New Zealand. Such databases offer the potential to provide contextual information on the genomic population structure and frequency, to help the food industry and the Ministry for Primary Industries to manage risks from this pathogen.

ESR will also continue to mitigate the risks to human health from radiation by ensuring radiation equipment is safe. We continue to operate New Zealand's National Centre for Radiation Science, which is the lead agency in the event of radiation emergencies.

An aspiration of ESR is to contribute positively towards a justice system that eliminates ethnic inequity. Furthermore, we aspire to realise the potential of mātauranga Māori to innovate our forensic techniques beyond the justice space.

ESR continues to lead in providing high-quality analysis, intelligence, advice and insights on water issues (such as supply contamination and infrastructure). We connect with multiple parties to detect and manage public health risks around water treatment and management.

Ko tō mātau whāinga /
Our intent

Our aspiration is that ESR builds on its growing science achievements to extend its impact as an internationally valued and renowned science institution. By pushing science boundaries and developing stronger, enduring partnerships across all aspects of our work, we will create co-designed, ground-breaking research portfolios, science toolkits and innovation pipelines underpinned by resilient systems. This work will further evolve and elevate ESR's science capabilities and leadership.

We are uncompromising in our quest to improve and evolve as a resilient, agile organisation.

Positive impact through collaborative leadership

We will be known as an organisation that builds **long-term sustainable partnerships with and for Māori**. We will build and strengthen our collaborations with universities and other research providers within Aotearoa New Zealand and internationally. We will continue to actively seek opportunities for collaboration across mutual areas of interest. We will also continue to explore how we can work to better co-ordinate systems and infrastructure to meet research and service delivery requirements and priorities. ESR's systems must be robust and secure but flexible enough to promote compatibility and portability of data sharing and encourage co-design and innovation. Such systems will allow our scientists to work in non-linear ways for effective delivery.

Te Tiriti and mātauranga Māori

To deliver on our Te Tiriti and mātauranga Māori aspirations, we must ensure the way we work is relevant to and inclusive of Māori. We will achieve this through partnerships that provide meaningful, customer-centric solutions for iwi and Māori communities. We will take an ambitious organisational cultural approach, ensuring ESR has the capability to deliver impact with Māori. We aspire to be an organisation Māori researchers will choose and view as their employer of choice. Our work as a national partner with Pūhoro STEMM Academy helps support young rangatahi to participate in science and develop as future science leaders.

Integrated science for impact

To solve complex health and environmental problems, such as antimicrobial resistance, and improve biomonitoring, biosecurity and forensic outcomes, our intent is to be known as a **leader in eDNA science and genomics**. We will be known as a leader in data science and computational capabilities. Data science and computational capabilities are vital enablers across ESR's cross-sectoral and transdisciplinary science and will help us co-design and develop comprehensive solutions that deliver value and benefits for communities. By transforming our predictive analytical, machine learning and artificial intelligence capabilities, we will further lift and transform ESR for the future.

An aspirational workplace

We want an aspirational and vibrant workplace with an organisational culture and a diverse and inclusive workforce that is distinctly Aotearoa New Zealand. This is essential for promoting different ways of problem-solving and working to meet the wellbeing needs of a changing New Zealand society.

We will continue to focus on the health, safety and wellbeing of our people and continue to ensure that our workplace policies, practices and procedures are appropriate.

Modernising the Kenepuru Science Centre is crucial to allowing our world-class scientists access to modern facilities, as well as making the facility and its science accessible to co-creation and co-learning with local communities, especially local iwi. We have invested in co-designing an iconic building with Ngāti Toa Rangatira, completed the groundwork geo-technics and received resource consent from Porirua City Council.

We will be a **sustainable** organisation that is **financially resilient**, with a portfolio of research and service delivery that enhances wellbeing and public good while also being commercially successful.

Shifts we will make

As we continue moving towards our future, we will make the following organisational shifts.

Delivering greater impact for and with Māori

As our cultural approach matures, our capacity and capability to confidently partner with Māori to facilitate, build and deepen genuine partnerships with iwi and communities will continue to grow.

We will build on lessons learned from our flagship He Wai Māpuna programme, to offer our science to the issues important to iwi and communities. We recognise that innovative and uniquely Aotearoa New Zealand mātauranga, science and research solutions are enabled by equally valuing both mātauranga and contemporary science to generate research portfolios that meet the aspirations and wellbeing needs of communities.

We are refreshing ESR's He Pūtaiao, He Tāngata strategy. Our approach recognises the need for an increased focus in multiple areas: Māori leadership, Māori-led and co-designed research, valuing mātauranga, and building lasting partnerships through increased cultural capability and capacity.

We are actively seeking expert Māori advice to guide our management of data at ESR through an ESR Māori data leadership roopu as well as working with other CRIs to develop a pan-CRI Māori data sovereignty policy. By gaining a deeper understanding of the needs of Māori communities we currently partner with, we can invest in a pipeline of relevant and meaningful projects.

Taking a greater leadership role in the health, environment, justice and food sectors to improve economic and wellbeing outcomes

We will continue to shape thought leadership in all the areas where our science is important: health, food, environment and forensic sciences.

ESR's scientific excellence and national leadership role for its reference laboratories will be critical to supporting the goals and objectives of the health and disability system, once the new entities become operational in July 2022. We will continue the important work to ensure the Infectious Disease Research Platform will transform research on and solutions to infectious diseases.

We will explore opportunities to increase strategic and mutually beneficial partnerships to scale up ESR's genomics capabilities for the future, and find new ways of delivering value. This will empower us to continue driving innovation and let us deliver better research outcomes and value through the integration of ESR's transdisciplinary science.

We will build on our collaboration with the New Zealand Police to develop new innovative solutions for reducing community harm. We will evolve ESR's forensic sciences to contribute positively towards a justice system that eliminates ethnic inequity. Furthermore, we aspire to realise the potential of mātauranga Māori to innovate our forensic techniques beyond the justice space.

ESR's research and applied intelligence will further inform understanding of the impacts from climate change by focusing on climate-sensitive infectious diseases and the effects of climate-related risks on health systems and critical infrastructures, such as wastewater and drinking water.

Broadening ESR's science leadership

We will lead systems thinking in various priority areas, such as pandemic preparedness, reducing drug harm and expanding wastewater epidemiology, and extend our capability and capacity in eDNA and digital science. We will continue shaping our genomics-first approach to our science and explore how we can establish a secure genomics database and platform for storing the genomic sequences of bacterial pathogens of interest. This important database will be essential for providing insights and intelligence to support further research and future health and environmental regulatory functions.

Increasing frontline responsiveness by improving e-infrastructure

Solutions-focused science must be reinforced by appropriate e-infrastructure. Our forensic science success with STRmix™, the Lumi™ Drug Scan Service and ESR's wastewater epidemiology are examples of innovation based on ESR's investment in e-infrastructure. We will invest to improve the functionality of ESR's science network and systems, to ensure the high-performance computing requirements needed to run the data pipelines that build additional tools and dashboards will support faster sharing of data and intelligence. This will improve public health surveillance, disease response readiness and decision-making across our impact areas of health, forensics, environmental science and food safety.

Work is under way to develop a central hub of health intelligence to better inform health decision-making. The appropriate e-infrastructure is vital to underpin innovative science where complex challenges require time-critical intelligence.

A thriving, people-centred workplace

We will be recognised as an employer of choice. Our people's ethnicity and diversity will be reflective of Aotearoa New Zealand's societal profile. We are positioned for continued and future success through strong accountable

leadership, and a healthy work environment as we seek to broaden our workforce talent and embed cultural competency. We will develop a new workforce capability framework to ensure ESR has the appropriate skills to deliver to these aspirations and future direction, including intentionally and actively recruiting for mātauranga capability.

We will continue to ensure our workplaces are developed to be the best environments for our people. We will continue to work with Ngāti Toa Rangatira and the Government so a new build decision can be made at Kenepuru as soon as possible.

ESR's investment in wastewater epidemiology for health and environmental surveillance is vital for detecting a range of biological or chemical indicators to provide insights about overall community health.

Photo: Andrew Chappell

Ko ngā wāhi tuku pūtea rautaki /

Strategic investment areas

Being clear about what science to pursue helps us determine where to invest in future-focused research programmes and world-leading research staff. We aim to create point-of-need technologies and new intelligence that will address current and future challenges to the wellbeing of New Zealand's people.

We recognise a one-size-fits-all approach to improving wellbeing is not sustainable or agile. The way we prioritise and invest in the future on valuable, customer-centric solutions will help shift the obstacles that cause inequities within New Zealand's society and economy.

Deliberate and cohesive investment, to further elevate ESR's culture, mātauranga and applied science capability and capacity, will drive even greater frontline responsiveness and impact where it is needed. We will mature our cultural capability to build an innovative portfolio of co-designed research and services that meet the needs of Māori communities.

To ensure ESR is better prepared to respond to health, environmental and justice challenges facing New Zealand, our investment for FY23 and out years will focus on continuing to strengthen ESR's systems and processes, shaping its future science direction and increasing its cultural capability and capacity.

We will take a sustainable and incremental approach to our investment decisions, to ensure we can make the changes that will help us deliver our aspirations and drive whole of system value.

Strategic investments for FY23 and onwards

Strategic objectives	What we are doing	Expected output and outcome	Expected delivery date
Reshaping ESR's science **Demonstrating commitment to Māori**	The Infectious Diseases Platform, co-hosted by ESR and the University of Otago, is in the establishment phase. For the remainder of FY21/22, we are finalising the governance and co-design of the platform.	The Infectious Diseases Platform, co-hosted with the University of Otago, will provide the opportunity to deliver strategic and frontline benefits to New Zealand's changing health system. Co-designed and governed with Māori according to Te Tiriti o Waitangi principles, it will lift New Zealand's capability and capacity to respond to infectious diseases that cause outbreaks or pandemics.	From September 2022, the platform will become fully operational
Reshaping ESR's science **Integrated thought leadership** **Developing strategic partnerships**	Increasing and expanding ESR's data science capabilities and strengthening ESR's relationship with New Zealand's universities. Extending ESR's research capacity.	We will work to develop ESR's future data science capability and direction for research and services. We will have partnerships with universities to provide support to extend ESR's research capacity and grow ESR's data science capabilities to solve real-world problems.	2024
Integrated thought leadership **Reshaping ESR's science** **Demonstrating commitment to Māori**	Led by the Māori Data Sovereignty Advisory Group, we are developing ESR's Māori data sovereignty treaty in practice framework and working with other Crown research institutes to develop a standard policy on Māori data sovereignty at the same time.	We are actively seeking expert Māori advice to guide our management of data at ESR through an ESR Māori data leadership roopu as well as working with other CRIs to develop a pan-CRI policy.	2024
Reshaping ESR's science **Demonstrating commitment to Māori** **A thriving organisational culture**	Increasing cultural capability and capacity for greater Māori impact.	We are investing in revitalised cultural competency programmes that will provide staff with the confidence to engage authentically with Māori on co-designed research.	Ongoing
		We will create five new full-time equivalent science roles across ESR and two dedicated mātauranga Māori positions to continue building mātauranga leadership capability, and shape ESR's future science to deliver increased impact for Māori communities.	2024/25

Strategic objectives	What we are doing	Expected output and outcome	Expected delivery date
Reshaping ESR's science **Strengthening ESR's business systems and processes**	We are investing in a new laboratory information management system (LIMS) and upgrading ESR's forensic LIMS	A replacement laboratory information system for the health and environment laboratories is vital to strengthening ESR's position as a 'one-stop shop' analytical laboratory. A platform for the transformation of laboratory processes and procedures using more efficient and effective electronic systems is required. We are also investing in upgrading ESR's forensic laboratory information management system, to strengthen diagnostic capability that will ESR's future forensic science direction.	2023/24
	Strengthening ESR's IT security and business platforms	We are committed to continuously improving ESR's cybersecurity maturity and capability as part of ESR's IT roadmap. We will collaborate and standardise approaches to IT security as part of the pan-CRI initiative that aims to deliver overall benefits to the wider government science and research community. Implementing Workday, the joint ESR/GNS Science Enterprise Resource Platform tool, is a significant and well-executed collaboration between GNS Science and ESR to drive efficiencies across ESR's business support systems. These tools will play an important role in lifting ESR's science by supporting integrated decision-making.	2023/24
	We are increasing our investment in public health surveillance technology	We will establish an intelligence hub to inform public health and policy decisions. We will also further improve the surveillance capacity of public health surveillance systems to include other conditions and diseases of national importance, ensuring ESR's pandemic and infectious disease responsiveness continues to increase.	Ongoing
	Establishing a project management office (PMO)	We will establish a PMO to support the integrated project planning, investment and decision-making functions that underpin ESR's science.	2023/24

Strategic objectives	What we are doing	Expected output and outcome	Expected delivery date
Reshaping ESR's science **Strengthening ESR's business systems and processes**	Property development	Progressing a renewed science and mātauranga research-led Kenepuru Science Centre located within the community to deliver sustainable, co-designed mātauranga and science-based outcomes for communities.	Dependent on Shareholding Ministers' decisions
	Laboratory upgrades	We are investing in upgrading ESR's laboratories. Modern, efficient workspaces and equipment will provide a safer environment for our staff, providing more space for research and opportunities for collaboration.	2023
A thriving organisational culture **Reshaping ESR's science**	Investing in organisational leadership, workforce capability and strengthening ESR's health and safety	By further developing ESR's workforce capability framework, we will increase our organisational capability and capacity and ensure ESR's people investment will meet future needs, is diverse and can deliver to ESR's aspirations. We are strengthening our organisational leadership capability to support the development and ensure the success of our people, further elevating our performance. We are also strengthening ESR's health and safety capacity and capability to support this critical work programme aimed at ensuring our people are kept safe and that ESR's work practices prevent harm.	2023/24

Ko ā mātau huarahi ki te whai pānga pūtaiao / Our pathways to science impact

We know impact is generated by integrating and combining applied science and mātauranga, appreciating these connections that broaden the path of co-design and innovation. ESR's approach to research-led science delivery recognises the value and importance of recombinant, cross-sectoral and transdisciplinary skills in developing valuable, comprehensive solutions now and in the future.

ESR's focus is firmly on using its applied scientific expertise at the intersection of health, justice, environment, water and food science to tackle issues of today and into the future. These issues include infectious diseases preparedness and resilience, antimicrobial resistance, food safety, mitigating climate change health and environmental risks, finding solutions to address water quality issues, and improving outcomes for the health and justice sectors.

ESR is increasingly integrating cross-platform Strategic Science Investment Fund (SSIF) research projects. This unites our scientific expertise to blend thought leadership with innovation to detect emerging issues. As we grow our connections with iwi, communities, key stakeholders and partners across government and the wider research, science and innovation system, we will find solutions that increasingly protect New Zealand's people and communities. It is this ability to link and piece together critical data and contribute to high-level systems intelligence and evaluation that delivers innovative science solutions to support national decision-making that drives value and leads to impact.

ESR's journey to having a greater impact and building resilience as a uniquely Aotearoa New Zealand research and delivery institution requires different ways of working and different approaches to how it uses its expertise. This includes:

- recognising and further embracing mātauranga Māori knowledge, to take a holistic approach to help us identify pathways to impact through innovation and co-design
- continuing to lift our capability to link and piece together critical data, knowledge and expertise by recognising the potential of enabling technologies and making smart use of them
- taking a multi-disciplinary and holistic approach to solving problems
- extending ESR's research capacity and capability through strengthened collaboration and partnerships between iwi, communities, universities and other science organisations.

With technology advancing at rapid rates, we recognise the importance of continuing to invest in strengthening our computational science capabilities and systems to support this capability. By creating new and using existing data pipelines in innovative ways, we can generate insights into existing research or explore fresh research topics. By generating new research and insights, we remain relevant and create opportunities for commercialisation while delivering on our mandate of protecting communities and improving wellbeing.

ESR's science capabilities

Maintaining our leadership in and expanding our genomics capability, and improving infectious diseases responsiveness, especially in relation to climate change, are critical to reshaping ESR's science and future success. We are also exploring how we can grow our capabilities in transformational DNA technologies and diagnostics for biomonitoring. This will help deliver increased impact to realise customer value and the public good.

Smart science investment

We are committed to continuing to grow and drive community-focused innovation to improve frontline responsiveness and connections for the human health, justice and environment sectors. By using holistic approaches, we will:

- continue expanding initiatives with current and new partners, including iwi, to deliver on the ground results
- continue to provide the applied science research-led delivery to inform responses to the COVID-19 pandemic
- strengthen New Zealand's public health responsiveness and resilience to manage current and future health threats by delivering robust and innovative public health solutions and surveillance, for example, through co-designed research activities within the joint ESR and University of Otago Infectious Diseases Platform
- blend our expertise and capability with enabling technology to further drive and support the transformation of the health and disability system to improve community outcomes
- deliver innovative tools and processes to reduce drug harm and elevate forensic science analysis to support and improve innovation for equitable justice outcomes

- develop systems thinking approaches and solutions to climate-related risks, including emergent infectious diseases, and food- and water-borne contaminants
- expand ESR's genomics capability and capacity for greater pathways to impact.

Pathways to impact

We are elevating our performance and delivery of applied science and services, and integrating our science capabilities across human and environmental health, forensics, food safety and radiation through the following science pathways:

- **innovative, community-driven science solutions** to create a targeted response or develop a point of need response to improve frontline responsiveness that will address specific problems, resulting in early detection and mitigation of health or environmental risks that will improve clinical care, wellbeing and/or reduce health inequities
- **creating improved or novel testing methods** that will improve workflows, sampling methods for monitoring, detecting and/or validating, and/or tools to improve analysis, intelligence and decision-making for public health, environmental, water, food and forensic sciences.
- **science to improve and inform regulatory frameworks**.

ESR's Pioneer Fund is a seed fund for exploring novel ideas that have the potential to create new areas of research, test an idea that could create new commercial value, or provide significant improvements to wellbeing outcomes. The focus of current and new Pioneer-funded projects is on growing science capability in eDNA and developing new or improving testing methods for reducing harm across health, justice and environment areas.

Strategic Science Investment Fund

ESR receives SSIF funding for research across three platforms:

- human and environmental health
- forensic science
- infectious diseases (from 2023).

Our applied research and service delivery focuses on using an integrated approach across science disciplines to support government and sector priorities and aims to create value and maximise impact.

We are increasing our investment in cross-platform research that supports the aims of both platforms. Nearly 17 percent of new and ongoing research projects are cross-platform with a strong focus on harm reduction.

Our research investment focuses on our priorities of:

- expanding our impact with and for Māori
- building genomics capacity for health, forensics and biosecurity
- expanding ESR's data science capabilities and capacity
- using social systems thinking.

This research is important for the early detection of diseases, detecting and mitigating various pathogens responsible for contaminating food and water supplies, improving health and environmental surveillance, developing new forensic tools to prevent, detect and resolve crime and improve justice outcomes. We are also developing tools to improve biosecurity and biomonitoring.

To maintain and enhance our genomic expertise, including the associated capabilities of bioinformatics and data science, we are continuing to invest in projects that apply new approaches to sequencing. These approaches will be an important component of the new Infectious Diseases Platform as we look to transition surveillance of pathogens and antimicrobial resistance to a genomics base.

We also have a strong focus on expanding our understanding and application of mātauranga Māori as it relates to health and wellbeing.

Our research projects

Solutions-focused science research projects

Research portfolio	Critical issue	Potential outcomes and impacts	Project duration
Māori impact/ Mātauranga Māori	Mātauranga Māori iwi ora: Restoring iwi historical wellbeing knowledge To support the wellbeing of whānau and iwi by restoring mātauranga lost through colonisation, and informing the current understanding of iwi wellbeing.	We will research and develop iwi indicators of wellbeing by exploring what historical instructions were left behind by Māori ancestors and explore how these instructions transpose into 21st-century health and wellbeing practices.	**New** until June 2025
	Develop and deliver Māori-led, mātauranga-based advice, expertise and solutions related to wai with iwi partners.	Continuing to expand the He Wai Māpuna programme to other iwi and develop new areas of research that help Māori communities lead and define research programmes that make a difference for Māori communities.	Ongoing until June 2024
	Increase the safety of mahinga kai resources for whānau and iwi through co-development of tools combining mātauranga and science.	Develop an adaptable and adoptable scalable mahinga kai assessment framework and resource with iwi to safely monitor and assess mahinga kai. This will enable iwi to confidently monitor their mahinga kai and request help with testing from ESR, as needed. Increased partnership with ESR, as a partner of choice, for ensuring the safety of mahinga kai.	Ongoing until June 2024
	Continuing to build ESR's partnership with Pūhoro STEMM Academy, showcasing ESR as an employer of choice to rangatahi and tauira Māori.	A large focus will be placed on resource development aimed at rangatahi and tauira Māori. We will develop our kura kaupapa focus through Pūhoro.	Ongoing until June 2024
Environmental science and sustainability **Māori Impact**	Investigate tikanga-guided frameworks for the management of wai and biowaste towards ōhanga āmiomio (circular economy) and carbon neutrality or negative. Explore and make use of natural systems (insects, plants and microbes) to recover and optimise resources from water and biowaste.	Demonstrate working examples of co-designed strategies and technologies of carbon-neutral circular economies of water and biowaste. Empower communities to contribute to waste management processes and decisions.	Ongoing until June 2023

Research portfolio	Critical issue	Potential outcomes and impacts	Project duration
Social systems aligned to health genomics through the Healthier Lives National Science Challenge	Reducing inequitable health outcomes for non-communicable diseases (NCDs) by developing culturally appropriate health interventions with and for Māori and Pasifika.	This research will explore how to co-design community NCD interventions by using adaptive sequencing technology that has potential immediate benefits for patients in a community or clinical setting.	**New** until June 2024
Forensics for health **Forensics for health and genomics**	Developing rapid point of use diagnostics using CRISPR Rapid Diagnostics.	Developing CRISPR-based assays that improve diagnostics for a range of key public health priorities and faster testing of forensic samples at the crime scene. This will help faster risk assessment and decision-making in the field.	**New** until June 2025
Health genomics	Use disruptive sequencing technology to rapidly generate, in real-time, a diagnostic test in a single sequencing run that will replace several traditional diagnostic tests needed in exomes of interest for hyperparathyroidism.	This research aims to provide a powerful and flexible platform for clinical genomic personalised medicine and build clinical capability for New Zealand. The proposed model will also facilitate more direct involvement between clinical and genomics teams, at the point of need.	**New** until June 2023
Health genomics, data science and supporting eDNA capability	Interrogating DNA methylation using new sequencing technology to provide real-time analysis of DNA of interest.	The project aims to increase the speed and accuracy of antimicrobial resistance screening by determining the antimicrobial-resistant bacterial species in clinical metagenomic samples. These analytical tools will be made available to the science community, in line with our current human genomics pipeline that is being used nationally, further enhancing our value and reputation.	**New** until June 2024
Influenza research	Influenza research that aims to prevent future pandemics, save lives and lead to more effective and longer-lasting flu vaccines.	This seven-year influenza and immunity study is a longitudinal study with two main cohorts: the Household and Infant studies. These studies aim to understand how prior flu exposures shape immunity to subsequent flu exposures. It will also track how the flu and other respiratory viruses (including COVID-19) spread from an infected person to others in a household setting.	Ongoing until June 2024

Research portfolio	Critical issue	Potential outcomes and impacts	Project duration
Social systems	Ensure our science aligns with the community's needs. Create a space where research, systems thinking, and external partners come together to collaboratively understand problems and co-design solutions.	Application of systems thinking to better engage and collaborate with communities and researchers across science disciplines. Increased knowledge and interest in science leading to stronger engagement with Māori and communities.	Ongoing until June 2023
Forensics, data science	Improve the detection of illicit drugs by developing a real-time, field-deployable biosensing technology platform based on aptamers for use on the frontline.	Applying the portable device as an on-site drug testing product by frontline users across a range of sectors for the early detection and mitigation of health risks associated with illicit drug use. Supporting the objectives of Alcohol and Other Drug Treatment Courts/Te Whare Whakapiki Wairua (AODTC).	Ongoing until June 2023

New innovative research and detection methods

Research portfolio	Critical issue	Potential outcomes and impacts	Project duration
Environmental science and sustainability **Māori impact/ Mātauranga Māori**	Securing New Zealand's groundwater supplies with data science and numerical tools to support the better management of water resources.	Understanding and quantifying pathogen and nutrient movement in heterogeneous groundwater systems. Merging machine learning and numerical tools for the simulation of nutrient and pathogen transport. Developing high-resolution 3D visualisation tools for contaminant groundwater hydrology applications. Regional councils and unitary authorities have better tools to manage their water resources.	Ongoing until June 2024
	Generate evidence for safe and sustainable use of biowaste by undertaking desk-top laboratory and field-scale experiments to understand how native plants can work to improve water quality and treat biowaste. Grow understanding and collaboration opportunities to support Māori communities.	We will develop a flagship programme using native plants to manage environmental problems, such as biowaste and water quality, based on community participation and co-learning, to increase participation and responsibility for environmental management. Enhance the value of low-productivity land through effluent attenuation, carbon sequestration, resilience to drought, native biodiversity, economic revenue, and income diversification.	Ongoing until June 2024

Research portfolio	Critical issue	Potential outcomes and impacts	Project duration
Environmental science and sustainability **Climate change**	Novel tools for sustainable wastewater treatment and enhancing contaminant removal in the face of climate change.	Develop tools for in-line assessment of wastewater treatment efficiency using an omics approach, including proteomic assessment of the processes occurring at the different treatment stages, to offer a rapid assessment of wastewater quality and stress within the treatment system. We will optimise wastewater treatment to include pathogen removal in a field-scale system to enable real-time assessment of wastewater disposal routes and impacts on local groundwater supplies. This will include monitoring pathogen transport, nutrient transport and emerging contaminant transport (including microplastics, personal care products and antibiotics).	Ongoing until June 2023
Environmental science and sustainability	Develop and establish a new science capability that contributes to safer drinking water for everyone living and visiting Aotearoa New Zealand.	Developing new genomic sequencing technologies for the early detection of pathogens in New Zealand's drinking water systems by assembling an appropriate metagenomic toolbox that can be applied to different drinking water needs.	**New** until June 2025
	Understand the resilience of groundwater to contamination (physical and chemical) by developing a groundwater quality assessment toolbox that will provide accurate assessments of groundwater ecosystems.	Improved description of groundwater systems for water-quality assessment and predictive tools for land-use impact assessment. This will support better-informed business and infrastructure decisions in terms of water quality impacts. Improved condition of groundwater quality through updated practices around water use and protection.	Ongoing until June 2023
	Evaluating denitrification remediation technologies for fast-flowing groundwater systems by carrying out investigations, installing field sites and design modification using geophysical investigations.	Demonstration of nitrate remediation technologies for fast-flowing heterogeneous groundwater systems. Strengthen collaborations nationally and internationally to build ESR's reputation in mitigation of high nitrate levels in groundwater and modelling denitrification.	Ongoing until June 2024

Research portfolio	Critical issue	Potential outcomes and impacts	Project duration
Environmental science and sustainability	Develop safe and representative tools for investigating pathogen attenuation and transport in fresh water and assessing water treatment effectiveness in pathogen removal.	Introducing a new approach to assess water treatment performance and pathogen attenuation and transport in fresh water by creating new tools to investigate pathogen mobility and persistence in water systems. This includes improving the ability to predict pathogen contamination than using the traditional *Escherichia coli* faecal indicator bacteria. Extending novel food-grade pathogen surrogate technology to reduce environmental impact, resulting in improvements in water quality.	Ongoing until June 2023
Health and environmental science, genomics for health	Understand the role wastewater plays in the antimicrobial resistance (AMR) landscape in New Zealand. Refining tools and methods to understand AMR in wastewater and investigate the use of AMR metagenomics for wastewater-based epidemiology.	Refining tools developed in Phase I of this project will be used to better understand AMR. The aim is to use these tools in public health surveillance to evaluate the impacts on human and animal health changes in society and the impacts of policy and other regulatory interventions to inform decision-making. Reduced environmental, health and wellbeing, and social impacts of antimicrobial resistance in wastewater.	Ongoing until June 2024
Infectious disease, health and environmental science, food safety	Establishing a human intestine model using organ-on-a-chip technology to determine which *Campylobacter jejuni* strains cause human illness and answer questions on pathogenic variability.	Using the organ-on-a-chip technology to identify which *Campylobacter jejuni* strains cause human illness will help develop mitigation strategies in the event of an outbreak, reducing the need to use animals to determine how these pathogens cause disease. Data generated has the potential to support policy and regulatory frameworks for food safety and public health.	Ongoing until June 2024
Genomics for health	Developing a New Zealand system to track the emergence or spread of antimicrobial-resistant plasmids.	We will conduct a systematic overview of plasmid signatures and the associated antimicrobial-resistant genes to track plasmid type and acquired AMR genetic elements in Aotearoa New Zealand. Determining any transmission in New Zealand care facilities will inform immediate infection control measures and long-term public health interventions.	**New** until June 2024

Research portfolio	Critical issue	Potential outcomes and impacts	Project duration
Genomics for health	Developing a new infection model to better understand meningitis.	Identify master regulators for meningococcal virulence and formulate a new strategy to combat the disease, including how new vaccines can be designed through developing an infection model to better understand meningitis.	**New** until June 2024
Genomics for food	Expanding ESR's capability as a lead provider of genomics for the food industry by advancing rapid sequencing capabilities.	Protecting New Zealand's food industry through the early detection and mitigation of emerging issues, such as AMR surveillance for the food industry.	**New** until June 2025
Genomics for forensics	Developing new forensic tools and assessments to provide the ability to reliably distinguish between direct and indirect DNA transfer between people at a crime scene.	Currently, no forensic assessments are available that can answer the question of "whose DNA is it?" and address the "where, when and how". We want to close the gap between published data on primary, secondary and tertiary DNA transfer, to reliably inform crime scene scenarios. Answering these questions will help the courts avoid miscarriages of justice.	**New** until June 2025
eDNA capability and eDNA metabarcoding	Finding new testing methods in molecular science and data science approaches, to unlock the secrets of mixed biological material and fill knowledge gaps by solving limitations of existing approaches and methods.	We are aiming to provide faster methods of testing and detecting mixed biological material that can be used for forensic investigations and biomonitoring, including developing new workflows and data visualisation tools.	**New** until June 2025
Forensics, data science, artificial intelligence	Identify and apply digital technology and data science applications to improve efficiency, effectiveness, and accessibility of science that will create a framework for the ethical use of artificial intelligence and develop machine learning tools for the justice sector.	Improve the ethical detection, response and resolution of pathways of crime that will help contribute positively towards a justice system that eliminates ethnic inequity and ensure New Zealand's criminal justice system is more efficient, effective and responsive.	Ongoing until June 2024

Research portfolio	Critical issue	Potential outcomes and impacts	Project duration
Forensics, genomics, data science	Understand how next-generation sequencing provides improvements to the identification and delivery of intelligence from DNA.	Develop and deliver a new intelligence service using new and validated DNA analysis techniques available to support case resolution. A new capability in the analysis of complex samples for justice sector users will provide improved detection, response, and resolution pathways of crime to ensure New Zealand's criminal justice system is more efficient and effective.	Ongoing June 2024

Supporting regulatory frameworks

Research portfolio	Critical issue	Potential outcomes and impacts	Project duration
Forensic science and public health	Providing ongoing regulatory advice and evidence regarding vaping product safety supported by robust toxicology data to reduce health harm and support improved public health and regulatory outcomes.	Reducing health harm and exploring the opportunity to develop testing for vaping metabolites in wastewater.	**New** until June 2023
Forensics	Understand the toxic effects and harm of synthetic cannabinoids and other new psychoactive substances by identifying the distinct molecular interactions responsible for the mode of action that will lead to mitigating the health risks associated with synthetic cannabinoids. Grow understanding and collaboration opportunities to support Māori communities.	Developing a drug-harm framework from data generated will inform an integrated drugs surveillance system that will lead to the early detection and generate high scientific value in advancing molecular and pharmacokinetic knowledge of synthetic cannabinoids. This work will provide new directions in drug treatment therapies, harm reduction, and policy development.	Ongoing until June 2024

Ngā inenga mahi a ESR /
Key performance measures

Our performance measures are aligned to our strategic objectives.

Integrated thought leadership: Performance measures

RESHAPING ESR'S SCIENCE AND INTEGRATED THOUGHT LEADERSHIP: Establish and embed methods and systems that enable a pipeline of innovative science ideas to deliver services and products for customers			
INVESTMENT	**PERFORMANCE MEASURE**	**FY22 TARGET**	**FY23 TARGET**
Demonstrating co-design and innovation	Number of project proposals that are approved for Innovation Funding by the NZ Police/ESR Strategic Governance Board. Number of projects where co-designed workshops are undertaken between NZ Police and ESR.	**New measure**	4 projects 2 co-design workshops
Building an innovation pipeline	Number of research projects awarded KiwiNet Tier 1 Pre-Seed funding by the KiwiNet Investment Committee. Number of research projects awarded KiwiNet Tier 2 Pre-Seed funding by the KiwiNet Investment Committee.	**New measure**	4 projects
Building an innovation pipeline	Number of research projects awarded KiwiNet Tier 1 Pre-Seed funding by the KiwiNet Investment Committee.	**New measure**	4 projects
	Number of research projects awarded KiwiNet Tier 2 Pre-Seed funding by the KiwiNet Investment Committee.	**New measure**	2 projects
	Number of Emerging Innovator applications awarded by KiwiNet Investment Committee.	**New measure**	2 researchers
	Upskill ESR's scientists in achieving impact through innovation.	20% of ESR's science staff have participated in science innovation workshops	≥20% of ESR's science staff have participated in science innovation workshops

INTEGRATED THOUGHT LEADERSHIP AND RESHAPING ESR'S SCIENCE: Develop and implement ESR's commercialisation approach			
INVESTMENT	**PERFORMANCE MEASURE**	**FY22 TARGET**	**FY23 TARGET**
Shaping and developing ESR's commercialisation approach	ESR's commercialisation framework proposal is developed and implemented: • innovation pipeline structure defined • project mapping completed.	**New measure**	Innovation pipeline structure defined and project mapping completed

Integrated thought leadership: Performance measures

RESHAPING ESR'S SCIENCE AND DEMONSTRATING COMMITMENT TO MĀORI: Māori-led research programmes and increasing Māori collaboration and partnership			
INVESTMENT	**PERFORMANCE MEASURE**	**FY22 TARGET**	**FY23 TARGET**
He Wai Māpuna programme	Co-designed projects with iwi increase from the FY22 target.	5	≥8
Kaupapa Māori or Māori-led research projects or services across ESR	Percentage increase from FY22 baseline in the number of co-designed research projects with iwi.	**New measure**	≥12%
Strategic Science Investment Fund (SSIF) funding allocation	Percentage SSIF funding allocated to projects led by and co-designed with Māori.	10%	≥12%
SSIF research impact	Percentage SSIF investment in cross-platform multi-disciplinary projects.	**New measure**	≥10%
Māori data sovereignty			
Māori data sovereignty programme	Develop a Māori data sovereignty treaty in practice framework.	**New measure**	Phase two of the programme is delivered by the end of FY23

INVESTMENT IN SCIENCE CAPABILITIES AND RESHAPING ESR'S SCIENCE: Investment in mātauranga Māori			
INVESTMENT	**PERFORMANCE MEASURE**	**FY22 TARGET**	**FY23 TARGET**
Uplifting mātauranga Māori capability	Number of new scientists employed as full-time equivalents to uplift mātauranga Māori capability.	**New measure**	5 FTE

RESHAPING THE FUTURE OF SCIENCE, INVESTMENT IN SCIENCE CAPABILITIES AND E-INFRASTRUCTURE: Uplifting data science and development capability			
INVESTMENT	**PERFORMANCE MEASURE**	**FY22 TARGET**	**FY23 TARGET**
Strengthening ESR's data science and uplifting capability	Develop and implement ESR's data science strategy.	**New measure**	Strategy implemented

Growing strategic and long-term sustainable partnerships: Performance measures

INVESTMENT IN SCIENCE CAPABILITIES AND RESHAPING ESR'S SCIENCE: Growing research collaboration			
INVESTMENT	**PERFORMANCE MEASURE**	**FY22 TARGET**	**FY23 TARGET**
Increasing international research collaboration	Number of international proposals submitted and accepted.	3	≥3
Overall success rate of external research bids	Overall success rate of external research bids.	14%	≥15%
Extended research capacity			
Extending ESR's research capacity and strengthening ties with New Zealand universities	Number of science graduates recruited to support research activity, innovation and increase ESR's research paper output.	**New measure**	2 doctoral students 2 post-doctoral students 1 summer intern undergraduate 2 graduate students

Developing a thriving organisational culture and demonstrating our commitment to Māori: Performance measures

CREATING A THRIVING ORGANISATIONAL CULTURE: Developing a workforce capability framework to assess workforce skills, development needs, and priority areas for investment			
INVESTMENT	**PERFORMANCE MEASURE**	**FY22 TARGET**	**FY23 TARGET**
Ensuring a workforce capability framework is in place to assess workforce skills, development needs and priority investment areas to grow capability	Develop ESR's workforce capability framework.	Framework developed	Workforce capability framework developed and implemented
ESR employee diversity is reflective of New Zealand society			
Establish employee diversity baseline and monitor	Establish employee diversity baseline and monitor.	Establish baseline	Improving against an established baseline

CREATING A THRIVING ORGANISATIONAL CULTURE: Building cultural capability and competency			
INVESTMENT	**PERFORMANCE MEASURE**	**FY22 TARGET**	**FY23 TARGET**
Building foundational cultural capability and competency	Percentage of staff who have participated in introduction te reo Māori courses.	35%	≥40%
	Percentage of ESR's permanent staff who have participated in a minimum of two foundational cultural capability courses.	**New measure**	≥50%
Improving the health, safety and wellness of ESR's people			
Improving ESR's health and safety processes and procedures	Continue to evolve ESR's critical risk management programme.	**New measure**	Implement control plans for ESR's critical health, safety and wellbeing risks and top events by the end of FY23

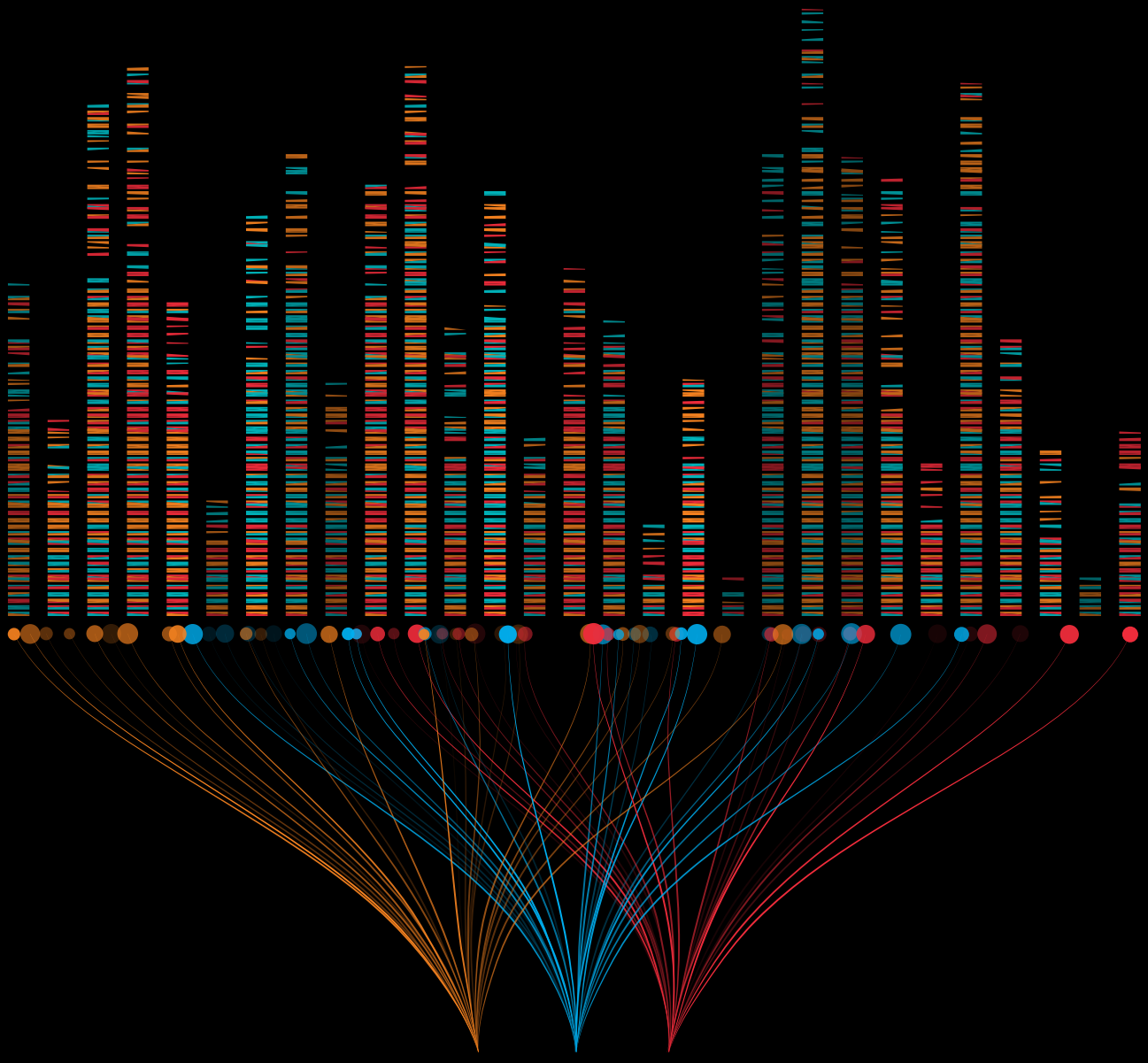
Strengthening business systems and processes: Performance measures

STRENGTHENING BUSINESS SYSTEMS AND PROCESSES: Strengthening integrated decision-making and targeted investment in capabilities and e-infrastructure			
INVESTMENT	**PERFORMANCE MEASURE**	**FY22 TARGET**	**FY23 TARGET**
Establishing and implementing a project management office (PMO) to support integrated decision-making	PMO is resourced and implemented by the end of FY23.	**New measure**	PMO implemented
Improving ESR's strategic business resilience and continuity maturity			
Strengthening ESR's business resilience and continuity maturity	ESR's business resilience and continuity maturity are managed or enhanced.	Raise resilience from level 3 to level 4	Resilience is maintained at level 4

STRENGTHENING BUSINESS SYSTEMS AND PROCESSES: Strengthening integrated decision-making and targeted investment in capabilities and e-infrastructure			
INVESTMENT	**PERFORMANCE MEASURE**	**FY22 TARGET**	**FY23 TARGET**
Technology roadmap: Developing a future IT operating model for ESR			
Deliver initiatives in ESR's Enterprise Technology Roadmap	Investment decisions are recommended based on the ESR-wide technology roadmap, focus areas are cloud-based services and security and public health surveillance.	**New measure**	Strategic investments are implemented and system resilience improved
Strengthening ESR's cyber security maturity	ESR's cyber security maturing rating is managed or enhanced.	Improving against an established baseline	Improving or maintained
Information management governance and management			
Information management governance and maturity	ESR's information management maturity is managed or enhanced.	**New measure**	Establish baseline
Sustainability and reducing carbon emissions			
Sustainable business practices and participating in the pan-CRI sustainability initiative	ESR's total corporate emissions of carbon dioxide equivalent is managed or improved.	**New measure**	Establish baseline

Strengthening business systems and processes: Supplementary performance measures

INVESTMENT	PERFORMANCE MEASURE	PURPOSE	FY22 TARGET	FY22 TARGET	FY23 TARGET
Effective and efficient investment practices	ESR maintains or improves its procurement capability index (PCI) self-assessment score.	PCI is an MBIE self-assessment scoring tool for government agencies so they can self-assess procurement practices and capability annually.	2.3	Between 2.7 and 2.8	Between 2.7 and 2.8
	Total commercial revenue.	Measuring the growth of ESR's commercial revenue.	$69.9m	$83.6m	$96.1m
Legal and governance obligations to protect and safeguard the assets of the organisation	ESR maintains a consistent audit rating.	To provide transparency of ESR's audit rating.	Good	Good to very good	Good to very good
Increasing the diversity and quality of the research, science and innovation workforce, including growing excellence and collaboration in research activity	Number of doctoral theses examined and number of postgraduate students supervised by ESR scientists.	Indicates the quality of ESR's scientists.	11	Between 8 and 10	12



HUINGA IRA

GENOME

Ngā āpitihanga /
Appendices

Appendix 1:
Ministry of Business, Innovation and Employment generic performance indicators

All Crown research institutes are required to report performance against the following measures.

INDICATOR	MEASURE	REPORTING FREQUENCY
End-user collaboration	Revenue per full-time equivalent (FTE) from commercial sources	Quarterly
Research collaboration	Publications with collaborators	Quarterly
Technology and knowledge transfer	Commercial reports per scientist FTE	Quarterly
Science quality	Impact of scientific publications	Annually
Financial indicators	Revenue per FTE	Quarterly

Core generic performance measures

These generic performance measures are designed to provide consistency across all Crown research institutes.

Strategic objectives	Performance measure	Purpose	FY21 actual	FY22 forecast or target	FY23 budget or target
Strengthening business systems and processes	End-user collaboration: revenue per full-time equivalent (FTE) from commercial sources	Domestic and international commercial revenue targets for end-user collaboration (revenue per FTE from commercial sources) and the knowledge exchange indicator (commercial reports per FTE) reflect commercial research activity	$149,000	$157,000	$165,000
	Financial indicators: revenue per FTE	Amount of revenue per FTE	$205,500	$204,000	$212,000
Reshaping ESR's science	Science quality: impact of science publications	Impact of science publications (measured using web of science citations for the previous calendar year)	4.13	3.8	4.0
Integrated thought leadership and impact	Research collaboration: publications with collaborators	These refer to publications prepared in collaboration with authors at other New Zealand institutes and/or international authors	70	75	80
Reshaping ESR's science	Technology and knowledge transfer: commercial reports per scientists FTE	Technology transfer refers to the process of conveying results stemming from scientific and technological research to the marketplace along with associated skills and procedures. It is an intrinsic part of the technological innovation process	0.27	0.36	0.39

Appendix 2: Financial projections

Revenue

ESR's improved financial performance in FY22 has been driven by the considerable amount of work carried out in support of the Ministry of Health COVID-19 response efforts, as well as improved earnings from other core contracts, commercial operations and research activity. This earnings growth has largely offset the loss of Crown COVID-19 response and recovery funding ($3.15 million) received in FY21.

Pandemic response activity for the Ministry of Health is expected to continue at current levels through FY23 and moderate during FY24 as this work transitions to a business-as-usual footing. This drives a fall in total revenue of 5 percent and a reduction in overall profitability in FY24.

ESR is anticipating modest growth in revenue from FY24. This will reflect improved research earnings (including influenza research and the impact of ESR co-hosting the Infectious Disease Research Platform with the University of Otago), the more sustainable terms incorporated into core government contracts and improved commercial earnings underpinned by the sale of STRmix™ forensic software in North America, Europe, and Australasia as product development continues and new markets are established.

Expenditure

Operating expenses are budgeted to increase in FY23 reflecting continued investment in ESR's staff, focused on increased science capability, increased services delivered to the Ministry of Health, and targeting increased spending across IT infrastructure, security, and health and safety. Cost efficiencies from the investment in finance and HR systems are expected to be achieved from FY23 (mitigating forecast cost pressures).

A reduction in service delivery costs is forecast for FY24, in line with the transition of the Ministry of Health COVID-19 response activity to a more business-as-usual basis.

Depreciation costs are forecast to increase in FY26, with the completion of the redevelopment of ESR's Wellington region Kenepuru Science Centre.

Investment

Further progress on the redevelopment of the Kenepuru Science Centre has been made during FY22, with Preliminary Design completed and Developed Design work under way. The Developed Design is due to be completed in October 2022 with initial demolition works planned to commence in December 2022, once the redevelopment project detailed business case is approved by shareholding ministers. The new facility is expected to be completed and occupied in FY26.

Following a system and vendor selection process undertaken in FY21, ESR is replacing its Enterprise Resource Planning (ERP) and Human Resource Management (HRM) systems. The implementation is being carried out in close collaboration with the Institute of Geological and Nuclear Sciences (GNS), with core systems due to be completed in FY22 and remaining functionality implemented by Q2 FY23. The Workday solution selected is a cloud-based software-as-a-service system and this requires system configuration and implementation costs to be largely expensed as incurred. This accounting treatment is impacting on the post-tax profit forecast for FY23.

The Statement of Corporate Intent (SCI) also provides for significant investment in ESR's laboratory information management systems across FY23 and FY24, and continued investment in the renewal of scientific plant and equipment, and other infrastructure.

Cash flow

Funding of the redevelopment of the Kenepuru Science Centre includes a $25 million capital contribution from the Government. This funding, existing cash reserves and forecast operating cash flows are anticipated to be adequate to support the planned investment incorporated into this SCI with some recourse to short-term debt facilities anticipated in FY26. ESR is forecasting a return to a cash surplus position in FY27.

Risk

There is uncertainty associated with ESR's revenue forecasts. The SCI assumes growth in research revenues from existing contestable and new sources, supported by increased investment in science capabilities and capacity, as well as increased commercial revenues from sales of STRmix™ software dependent on ongoing product and market development. Financial performance is also underpinned by the sustainability of terms to ESR's core government contracts.

Some uncertainty also exists around the ultimate cost of redeveloping the Kenepuru Science Centre. While the progress of the design process has improved the quality of cost forecasts, the final degree of environmental impact mitigation required to be implemented (including Green Star rating) may still affect the overall cost of the project.

Furthermore, the challenges facing the New Zealand construction industry are not expected to resolve quickly and present some ongoing risk.

ESR will continue to actively monitor and respond to known and emerging financial risks.

Dividend

In determining surplus funds for distribution, the ESR Board will give consideration to factors including the organisation's medium- and long-term capital investment requirements. The majority of available cash surpluses are required to fund the redevelopment of the Kenepuru Science Centre and modernising infrastructure at all our science centres. Therefore, no dividend payments are projected to be made over this SCI period.

Financial performance indicators

The table below shows the key financial performance indicators for the five-year period FY23–FY27.

	FY23 BUDGET	FY24 FORECAST	FY25 FORECAST	FY26 FORECAST	FY27 FORECAST
Revenue (000's)	**123,545**	**117,157**	**124,068**	**129,140**	**133,676**
Revenue growth	14.0%	-5.2%	5.9%	4.1%	3.5%
Revenue per FTE ($000)	212	206	216	224	232
Operating results ($000s)					
Earnings before interest, tax, depreciation and amortisation	10,384	9,205	12,476	13,868	15,393
Net profit after tax	2,071	1,318	3,215	3,545	4,168
Liquidity					
Quick ratio (acid test)	2.3	1.5	0.7	0.7	0.9
Profitability					
Return on equity	3.5%	2.0%	4.0%	3.9%	4.4%
Operating margin	8%	8%	10%	11%	12%
Operating margin per FTE ($)	17,808	16,155	21,705	24,043	26,687
Operational risk					
Profit volatility	39.8%	39.8%	15.5%	20.2%	10.5%
Growth and investment					
Capital expenditure	13,667	35,120	40,544	15,460	6,400
Capital renewal	1.7	4.5	5.0	1.7	0.7
Dividend	–	–	–	–	–
Financial strength					
Gearing (debt*/debt and equity)	5%	4%	3%	5%	2%
Equity ratio (equity/total assets)	67%	70%	75%	74%	76%
Cash reserves ($m)	31.7	15.5	1.3	–	5.4
Short term borrowing ($m)	–	–	–	2	–

** Lease liabilities and short-term borrowing*

Appendix 3: Subsidiary

SUBSIDIARY	PRINCIPAL ACTIVITY	INTEREST HELD (%)
STRmix™	Forensic software that helps resolve complex mixtures of human DNA.	100

Appendix 4: ESR policy and procedure statements

Good employer policies

Workforce planning and capability development

Our people are fundamental to the delivery of ESR's strategic priorities and its success. It is also essential that ESR has the right expertise and leadership available for the future. We will continue to shape our workforce to ensure we plan for and build capabilities that align with ESR's future needs and that of the wider science system to deliver benefit and impact for New Zealand's people.

We aim to complete ESR's workforce capability framework by the end of June 2023. This will further expand people capability and development by creating more integrated investment in organisational capabilities and training initiatives that align with ESR's future direction. This will ensure that ESR's diverse, yet highly specialised workforce reflects Aotearoa New Zealand and is fully supported to reach their career goals and develop to their full potential.

As part of our workforce planning, we aspire to be an organisation Māori researchers will choose and view as their employer of choice. We aim to extend ESR's cultural capability and capacity across multiple areas, including growing Māori leadership, Māori-led research and recognising the value and contribution of mātauranga.

Good employer obligations

At ESR, we encourage diversity and recognise the value and importance of an inclusive workforce with unique perspectives and knowledge to generate new ideas and solve problems. An inclusive workforce helps shape the science system for the benefit of everyone. ESR's workforce includes people from many different ethnicities, and women represent nearly two-thirds (64 percent) of our employees who work at all levels and roles in our organisation.

We advocate equal employment opportunity recruitment practices for recruiting, selecting, developing, managing and retaining staff, ensuring Māori are aware of employment opportunities at ESR to achieve their kaupapa. We closely monitor and ensure that we are a fair employer without gender or ethnic pay gaps to build performance, retain staff and eliminate discrimination.

A core focus of ESR's manaakitanga toward its people is ensuring the health, safety and wellbeing of its staff. We ensure we have the appropriate culture, systems, processes, and procedures to look after the health and safety of our people while supporting dynamic working conditions and flexible working arrangements. This is crucial as we continue to navigate the effects of COVID-19. Staff are provided opportunities to actively participate in health and safety committees and identify further opportunities for improvements across ESR's mahi. This is vital for the safe delivery of ESR's world-class science.

Accounting policies

A summary of our accounting policies is included in our Annual Report. The current Annual Report can be found on the website: https://www.esr.cri.nz/home/about-esr/corporate-publications/2021-annual-report

Dividend policy

The Board will notify the shareholding Ministers, within three months of the end of each financial year, of:

- the amount of dividend (if any) recommended to be distributed to shareholding Ministers
- the percentage of tax-paid profits that the dividend represents

- the rationale and analysis used to determine the amount of the dividend.

In determining surplus funds for distribution, the Board each year will give consideration to:

- the organisation's medium- and long-term capital investment requirements
- the organisation's projected profitability and cash flows
- the ongoing financial viability of the company, including its ability to repay debt
- the ability of the organisation to react to revenue shocks outside its control, and still maintain and enhance the capability of its people and facilities
- the obligations of the Directors under the Companies Act 1993 and other statutory requirements.

Before making a decision on payment of a dividend, the Board will consider the above factors and consult with the shareholders.

Significant transactions policy

The Board will obtain the prior written consent of shareholding Ministers for any transaction or series of transactions involving full or partial acquisition, disposal or modification of property (buildings, land and capital equipment) and other assets with a value equivalent to or greater than $10 million or 20 percent of the company's total assets (prior to the transaction), whichever is the lesser.

The Board will also obtain prior written consent of shareholding Ministers for any transaction or series of transactions with a value equivalent to or greater than $5 million or 30 percent of the company's total assets (prior to the transaction) involving:

- acquisition, disposal, or modification of an interest in a joint venture or partnership, or similar association
- acquisition or disposal, in full or in part, of shares or interests in a subsidiary, external company or business unit
- transactions that affect the company's ownership of a subsidiary or a subsidiary's ownership of another entity
- other transactions that fall outside the scope of the definition of the company's core business or that may have a material effect on the company's science capabilities.

Appendix 5: Matters required by the Crown Research Institutes Act 1992

Ratio of shareholders' funds to total assets

The Institute of Environmental Science and Research's forecast ratio of shareholders' funds to adjusted tangible assets is as follows.

SUBSIDIARY	2021/22	2022/23	2023/24
Equity ratio	0.67:1	0.67:1	0.71:1

Activities where shareholder compensation is required

Where the Government wishes ESR to undertake activities or assume obligations that will result in a reduction of the organisation's profit, or net worth in terms of investment in research, the Board will seek compensation sufficient to allow the organisation's position to be restored.

No requests for compensation are currently under consideration.

Other matters specifically requested by the shareholder

Section 16(3) of the Crown Research Institutes Act 1992 requires ESR to furnish an estimate of the current commercial value of the Crown's investment.

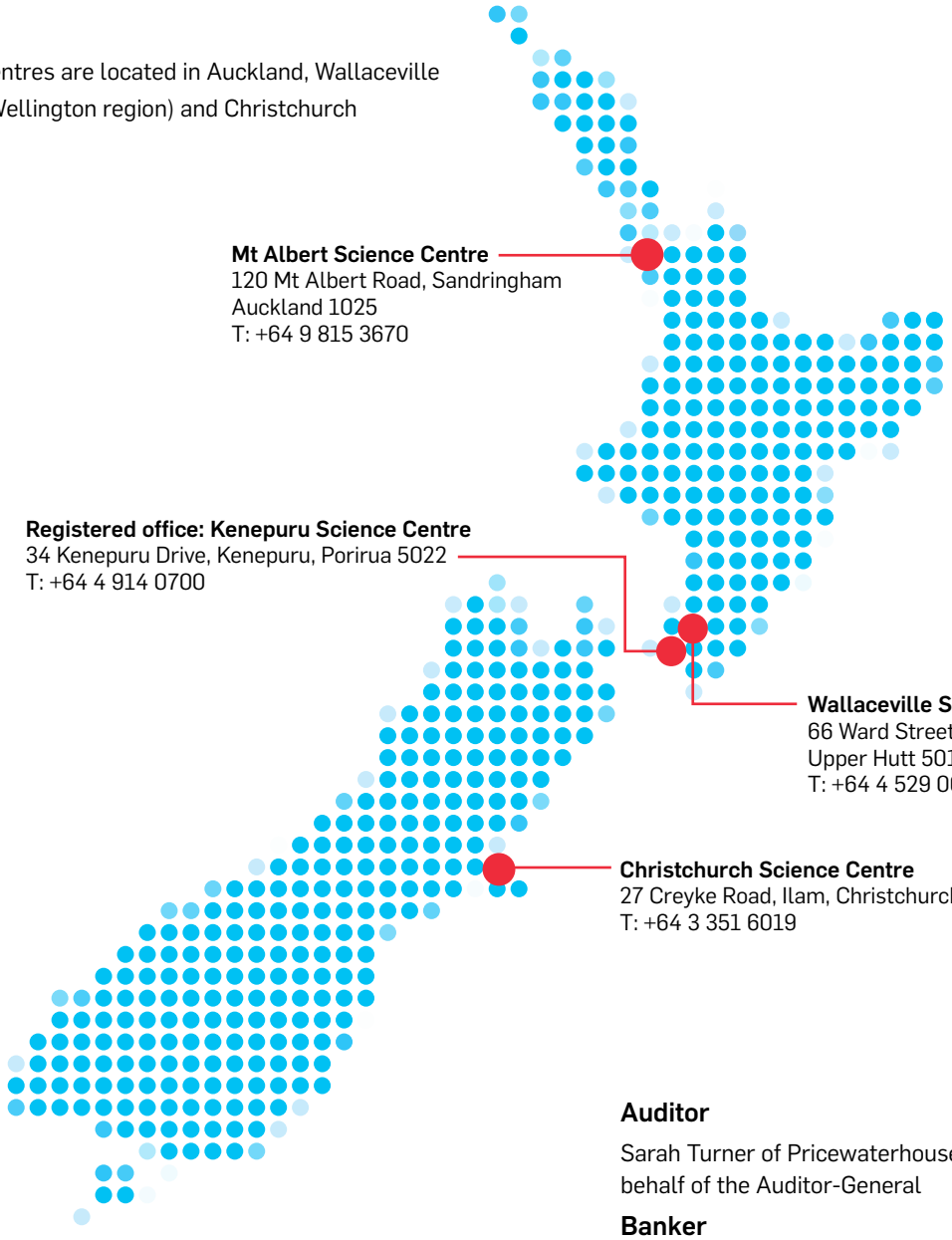
ESR's Board has conducted a review of the commercial value of the Crown's investment in the company. In this regard, the Board is satisfied that the net asset position (or total shareholders' funds) as at 30 June 2021 is a fair and reasonable indication of the commercial value of the Group. The net asset position, as shown.

The net asset position, as shown in accordance with the company's accounting policies for 30 June 2021, was $60.12 million.

Photo: Heidi Baker

Directory

ESR's science centres are located in Auckland, Wallaceville and Kenepuru (Wellington region) and Christchurch



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Auditor

Sarah Turner of PricewaterhouseCoopers on behalf of the Auditor-General

Banker

ANZ Bank New Zealand Limited

Solicitor

Buddle Findlay

Photo reference:

Page 10: In May 2022, the Biowaste team established a field experiment at the Christchurch Wastewater Treatment Plant to investigate the effect of biosolids application in the health of certain New Zealand native plants. Previous research shows that most native plants respond well to biosolids addition in low fertility soils. Over 1,100 plants were planted by the team.

Science working for New Zealand

The Crown Research Institutes (CRIs) proudly work, individually and collectively, to create a more prosperous, sustainable and innovative New Zealand

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