

Te Tauāki Koronga Mahi 2021–2026
Statement of Corporate Intent



Tautohua
Detect

Identifying
emerging issues

Tūhonotia
Connect

Developing and using
best applied science
resource + solutions

Tiakina
Protect

Keeping communities
healthy and safe

He kaupapa pūtaiao hei hāpai i te hauora me te noho haumaru o ngā hapori

Science for healthy, safe communities

Among the Crown research institutes (CRIs), ESR is unique in having the sole focus of protecting and improving the health and wellbeing of communities. Combining and applying expertise from our rich array of health, forensic, food, water and radiation sciences allows communities to thrive and prosper.

Cooperating with other CRIs and government ministries enables our detection capabilities that have been recognised worldwide and are being courted for collaboration by leading global research organisations.

We are hungry to learn and **improve**. **Improving** the quality of water through contamination identification and elimination enhances Te Mana o te Wai and allows replenishment through safe drinking. **Improving** our knowledge of disease and developing our research mechanisms to identify, manage and eliminate harm, uplifts the health of communities, and allows them to better participate in education and be prosperous.

Improving the safety of communities through tracking and identifying substances and individuals who cause harm improves vitality and wellbeing. **Improving** the applied science that ensures New Zealand's primary products are free of contamination to meet the requirements of global export markets. This is the heart of ESR science.

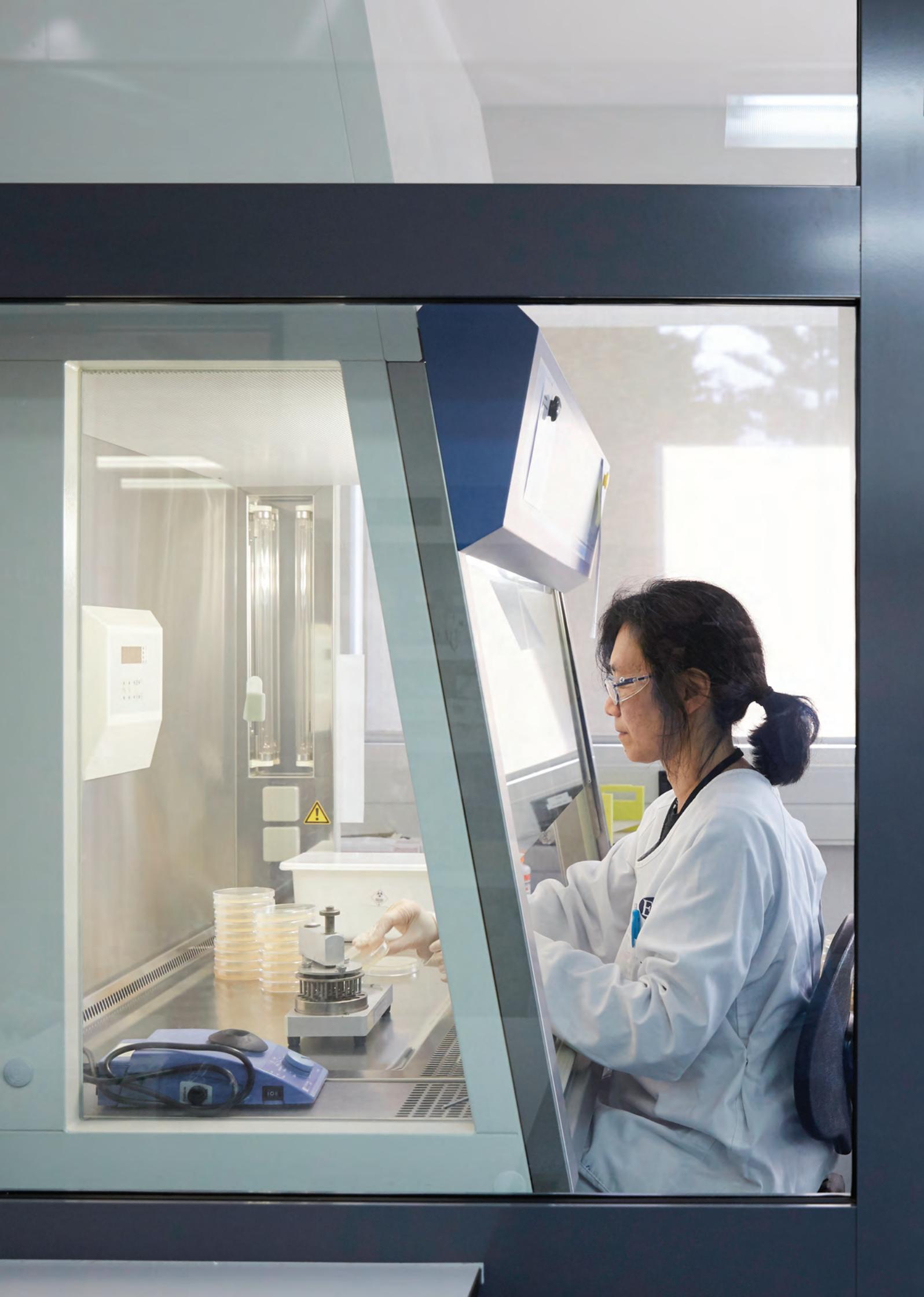
As a CRI we are **ambitious** and continuously learning and evolving. Critical to our journey is the transformation of ESR's DNA so that Mātauranga Māori is at the heart

of everything we do. Our **ambition** is that we will be one of the first science organisations to be acknowledged by Māori as a partner who acts as one with Māori to every extent and purpose in our mahi. Our **ambition** is that our physical spaces will be an extension of the rohe within which we sit, where tāngata whenua will feel they belong. Our **ambition** is that our science walks with mana within Te Ao Māori and combines Western science and Te Ao Māori science in a seamless way in everything we do. Our **ambition** is that young Māori will be awakened to the wonders of scientific knowledge and as the next generation of kaitiaki apply science to heal and nourish their whenua, wai and whānau.

Who are we? We are the CRI that has the leading edge applied science thinking and the ability to distil intelligence from health data, providing the science heart of New Zealand's health system. **We are** the infectious disease scientists who know how to work with communities to deliver frontline health applications and surveillance. **We are** the water and foodborne disease scientists who enhance the mauri of wai and ensure the ora of kai. **We are** the DNA and illicit substances scientists who enhance the safety and wellbeing of communities. The combined integration of these capabilities to provide thought leadership on complex community challenges is the strength of ESR.

Looking to the past to inform and undertaking world-leading research to prepare for the future, embracing Te Ao Māori to achieve scientific excellence, we will continue our journey of solving the challenges that face New Zealand communities today and prepare for the challenges of tomorrow.

We are ESR.



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**ESR is New Zealand's Crown research institute
specialising in science for communities**

*Presented to the House of Representatives pursuant to
section 16 of the Crown Research Institutes Act 1992.*

Hei painga mō Aotearoa

Delivering for New Zealand

We are pleased to present the Institute for Environmental Science and Research's (ESR) Statement of Corporate Intent (SCI). This describes our strategy, key initiatives and performance measures for 2021/22 and forecasts our activity over the following four years.

This SCI has been prepared at a time when New Zealand is tentatively exploring how it safely opens its borders while the world still grapples to control the effects of the global COVID-19 pandemic. New Zealand has managed the effects of COVID-19 better than most countries. ESR's molecular scientists, epidemiologists and analysts played a leading role in establishing then expanding genome sequencing and the multi-disciplinary analysis needed to distil the public health intelligence that underpinned New Zealand's success.

New Zealand's economy relies significantly on the export of primary sector goods and the import of people through tourism and skilled workers to grow the economy. With this in mind, ESR will continue to focus on solutions that contribute to New Zealand's economic recovery through helping to facilitate border openings. We will continue to provide services to private sector companies to ensure the products they export meet the food safety requirements of their markets.

ESR is not only delivering public health solutions for today, it is actively preparing for the challenges of the future. We are doing this in the same way that our research and science transformation over the past five years prepared us for COVID-19. Responding to

the health impacts of climate change and ensuring community wellbeing is enhanced are core to ESR's work and we are pursuing science-based solutions in areas such as genomics, social systems and digital forensics. We are working with customers and stakeholders to continue to develop and co-create leading edge solutions.

With the announcements of reforms in the health sector, we will work with the Government to ensure our work aligns with the relevant system shifts required to meet the vision of a health system that meaningfully achieves pae ora (healthy futures) for all.

An important outcome will be the successful negotiation and implementation of our contractual relationships with the Ministry of Health, Ministry for Primary Industries and the New Zealand Police. ESR believes better outcomes are generated when strategy and delivery are co-created so that when contracts are formalised, the applied science being delivered is nimble and agile to meet mutually agreed public health, primary industry and justice objectives. This approach is being embraced by all parties and we are confident it will deliver better overall value for the people of New Zealand.

ESR is committed to embracing Mātauranga Māori as a foundation element of ESR – so that it is part of our DNA. The Board and Leadership Team fully embrace the value that Mātauranga Māori brings to ESR. We continue to seek opportunities to pursue whakawhanaungatanga with iwi and to proactively enable Māori leadership, participation, and Mātauranga Māori in synergy with our science programmes.

The rejuvenation of our science centre at Kenepuru to a world-class science facility that embraces the mana and wairua of Ngāti Toa Rangatira is equally important to us and Ngāti Toa Rangatira. As mana whenua and partners with ESR, Ngāti Toa Rangatira are deeply engaged and involved in all components of the design and build process. We look forward to working with the Government as our shareholder to achieve a successful build case this year.

Critical to our success will be our ability to shift and flex our science to deliver the innovative solutions required to address the human science challenges of tomorrow. Innovation and foresight require governance structures that allow nimble decision making – to take a chance – to predict and prepare to be ahead of the curve. Governance that allows critical risk-based science decisions to be made quickly is essential to the future success of ESR in delivering relevant science outcomes for New Zealand communities.



Denise Church QSO
Chair

We have prepared a plan, with the ongoing support from the Government as shareholder, which will let us continue to:

- embed Mātauranga Māori into our science and who we are
- deliver applied science solutions, services and policy-ready information to our sector partners
- provide assured science sector and public health leadership in times of disruption
- deepen collaboration and interconnectedness that delivers value to New Zealand
- innovate to develop products and services that improve New Zealand's wellbeing
- invest in people and infrastructure to ensure we have the right capability and capacity to apply new scientific solutions to future challenges
- increase New Zealand's and ESR's global scientific reputation through collaborative projects.

In this way we will continue to contribute to the Government's goals of improving the health and wellbeing of New Zealanders building a resilient and robust economy, and enhancing the wairua of wai and the ora of kai.

ESR's Board, Executive and people are committed to delivering the initiatives outlined in this SCI and to delivering excellence in science-led solutions for the health and wellbeing of New Zealand communities.



Peter Lennox
Chief Executive Officer



“Our purpose is to ...”

... deliver enhanced scientific and research services to the public health, food safety, security and justice systems, and the environmental sector. By doing this, we help improve the safety of, and contribute to, the economic, environmental and social wellbeing of people and communities in New Zealand.” *(Statement of core purpose)*

Supporting the Government’s key priorities

Accelerate New Zealand’s Economic Recovery:

we will engage in the implementation of government and industry strategies including advancing the consistency of environmental data sets and insights.

Our work will align with the climate change and sustainability programmes, in particular, water- and land-use.

Maintain strategic relationships: we will employ a collaborative approach to increase the effectiveness of our strategic relationships with our partners including the Ministry of Health, the New Zealand Police and Ministry for Primary Industries, focusing on improving wellbeing, social, justice and economic outcomes. This is particularly important in light of the recent Health and Disability System Review. In addition, we will use our expertise to support the role of Taumata Arowai¹ to ensure all communities have access to safe drinking water and protecting the environment from the impacts of waste and stormwater.

Te Pae Kahurangi Report: we will progress an integrated holistic approach of ensuring effective engagement and collaboration, based on building strategic partnerships with Māori, businesses and key stakeholders including the government, research and international organisations. In addition, we will share resources, services, capability, assets, and people to build a resilient and responsive science community.

Maximise impact of collaboration: we will actively pursue new opportunities to collaborate and seek out opportunities within existing relationships to maximise impact and build resilient infrastructure in our business cases.

COVID-19, hazard management and emergency response: we will continue our leadership role in the response and management of COVID-19, ensuring we are well connected and we increase our scientific capability and resilience to support government evidence-based decision making. Using the lessons learnt from the COVID-19 pandemic, we will prepare and build resilience for any potential emergency responses and hazard management.

1 Dedicated water service regulator for Aotearoa.



Vision Mātauranga: we will continue to grow, invest and integrate Mātauranga Māori science and research programmes. We will actively co-design with Māori ensuring a development approach in research, science and innovation that is distinct to Māori, improving Māori economic, social and wellbeing outcomes and impacts. Aligned to this is expanding our Māori-led research programme, He Wai Māpuna which uses wai as the vehicle to unlock impacts for Māori.

Wellbeing and workplace diversity: we will advance and develop Māori knowledge, research expertise and capability as a core part of ESR's identity. We will ensure that:

- we continue to act as a good employer with policies supporting diversity and inclusion across ESR to increase our impact; and
- our remuneration is consistent with other government organisations applying principles of pay restraint and pay equity.

Deliver an integrated research science and innovation (RSI) system: we will employ a pan-CRI approach to building business support services to maximise efficiencies and connectiveness through shared virtual IT security services, common Enterprise Resource Planning platforms, laboratory information systems and the development and implementation of a national environmental data centre.

Deliver on the Carbon Neutral Government Programme: we will actively support the all of government initiative of transitioning to carbon neutrality by the end of 2025. We look to achieve this through vehicle fleet optimisation and reducing reliance on petrol and diesel vehicles, where operational requirements, allow as well as ensuring our office and science facilities are more compliant with the energy efficiency building rating standard. We will make significant progress to achieving our carbon neutrality goal with the new Kenepuru Science Centre, which is due for completion in 2025.

// Ngā tūmanako mō āpōpō

Our desired future state

Outcome for New Zealand

An Aotearoa we all want to live in, where the health, safety and wellbeing of our iwi and communities is protected

We will enable New Zealand to have

Healthier communities; Safer communities; Safer food; Cleaner water

Our mission

Ora through knowledge:

- We harness the ingenuity of our people, innovative science, and technology and relationships to solve problems to strengthen New Zealand's health, safety and wellbeing
- We create innovative products and services for communities around the globe for the enduring benefit of New Zealanders

Research and science 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 services applied to safety, security and justice investigations and processes

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

Our strategy

- He Pūtaiao, He Tāngata
- Understanding our value
- Shaping the future of our science
- Increasing our impact
- Building our team
- Building stronger foundations

Achieving more for New Zealand's people, communities and the environment

ESR has a proud history of harnessing science and research to protect New Zealand from crime, disease and environmental threats.

We have a long list of research achievements and an excellent track record of responding quickly to solve problems for our customers and for iwi and communities at risk. Everyone at ESR is committed to making a positive difference for iwi and communities.

Responding to a changing environment

In recent years, there have been significant changes and developing needs across New Zealand. ESR has been at the forefront of responding to these needs. As an influential applied science advisor to the Government and wider community, we will deliver innovative science solutions ensuring the health, safety and wellbeing of our iwi and communities are protected.

We know we cannot achieve greater impact alone. Meaningful and effective partnerships with iwi, government, key stakeholders, customers, other national and international science research organisations is critical. We must collaborate and innovate with others, understanding their worlds for our work to push new boundaries and elevate our impact for New Zealanders.

We recognise the value of Mātauranga Māori and the need for co-development to increase our impact with Māori and realise equitable outcomes.

Our commitment to innovation is and has always been on:

- transitioning ESR for growth and greater impact
- managing, responding, creating and using evolving technology
- connecting and responding to everchanging social, environmental, justice and wellbeing trends
- evolving our operating model, ensuring we are financially sustainable in a time of fiscal constraint.

Our expertise is more critical than ever in preparing for and responding to some of the biggest issues facing New Zealand including any future pandemics, water quality and climate change. We will also continue to mitigate the risks to human health from radiation by ensuring radiation equipment is safe. We operate New Zealand's National Centre for Radiation Science, which is the lead agency in the event of radiation emergencies.

To achieve this, we are growing our capability in emerging areas of science and research, embracing new technologies and embedding a customer-centric approach and innovative ways of working to stay current. Aligned to this we are strengthening our processes, systems and tools that underpin the delivery of our science and research.

Māori impact in progress

Our strategy reflects our desire and focus where we are continuing to grow enduring partnerships with Māori, as strategic partners, knowledge contributors, customers and beneficiaries of our science. This helps us deliver innovative solutions that will elevate our performance to achieve the best outcomes for New Zealand.

He Pūtaiao, He Tāngata, our plan for achieving greater impact with Māori, is woven through every aspect of our strategy. We are shifting from engagement with Māori as an activity to impact with Māori as part of our core identity. Through Māori-led research programmes and developing our Māori capability through both intentional recruitment and focused training, we will increase our impact with Māori.

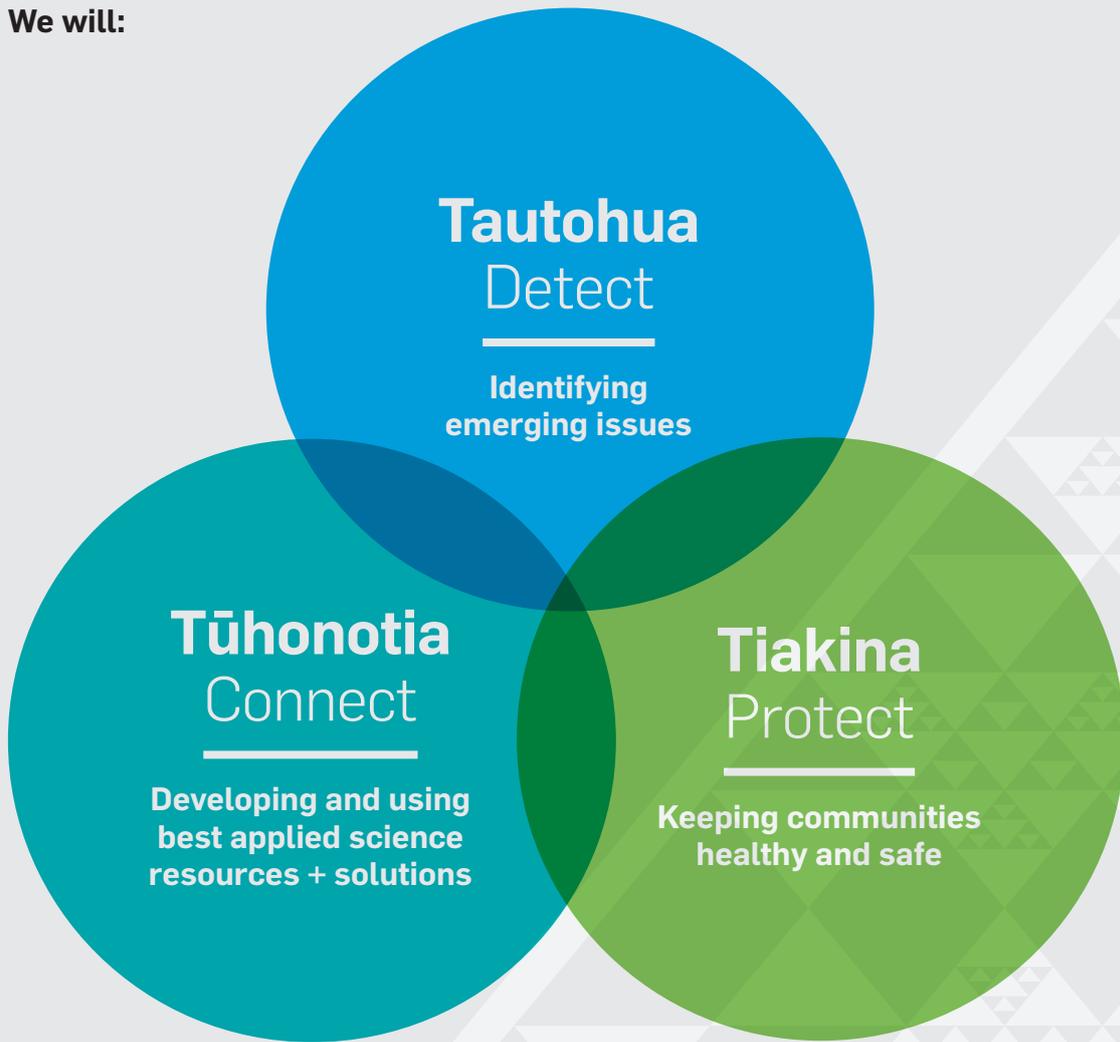
Impact of the Health and Disability System Review

In light of the Government announcements of reforms in the health sector arising from the Health and Disability System Review, we will ensure our work aligns with the relevant system shifts required to meet the vision of a health system that meaningfully achieves pae ora (healthy futures) for all: where people live longer in good health, have improved quality of life and equity exists between all groups. We will focus on collaboration and cohesion, and on the interests of our customers, iwi and communities for national benefit.

Our strategic framework



We will:



Through our ability to:





Our strategic focus areas

Our strategic focus areas allow us to create the future we want through harnessing the ingenuity of our people, innovative science and technology. This helps us to solve problems in partnership with key stakeholders, including government, industry and Māori, to strengthen New Zealand's health, safety and wellbeing. We create innovative products and services for communities around the globe for the enduring benefit of New Zealanders.

Mātauranga Māori is at the heart of everything we do and critical to our journey.



He Pūtaiao, He Tāngata

Supporting the aims of the Vision Mātauranga

Valuing and combining Māori and Western knowledge enables innovative science and research solutions that are uniquely Aotearoa New Zealand – increasing the wellbeing of our communities and the environment

Strategic focus area

Our future state



Understanding our value

"Growing our innovation and influence by putting our customers, iwi and communities at the core of our mahi"

Regarded as an influential leader building valued and meaningful partnerships with our customers, iwi and communities, continually improving health, safety and wellbeing outcomes



Shaping the future of our science

"Remaining relevant and building trust in science and scientists by ensuring our customers, iwi and communities' aspirations and needs are met"

Fundamentally embracing a Te Ao Māori approach to achieve scientific excellence, positioning ESR for future success

Enhancing our reputation as an influential leader co-designing transformational research and service delivery that meets the needs of our customers, iwi and communities within the wider science system



Increasing our impact

"Improving outcomes for our customers, iwi and communities through innovative science"

Providing collaborative, prioritised and integrated research that grows innovation, and seeking to secure opportunities to deliver better outcomes for our customers, iwi and communities



Building our team

"Capable and engaged staff, strong, accountable leadership, and clear strategic direction"

Recognised as an employer of choice

Our ethnicity and diversity is reflective of 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



Building stronger foundations

"Embedding and strengthening our infrastructure, systems and processes by strengthening our collaboration partnerships"

Effective business and governance systems, enabling decision-making to be smarter and more impactful in delivering research and science solutions for our customers, iwi and communities

Proactive Responsive Diverse Resilient Relevant

The shifts we need to make to become a more proactive, responsive, diverse, resilient and relevant organisation for the future are articulated as follows.



Understanding our value

“Growing our innovation and influence by putting our customers, iwi and communities at the core of our mahi”

By better understanding our customers' needs, and tailoring innovative solutions to their problems, we will improve our reputation as an influential advisor and problem solver. Our reputation will allow us to grow and become more connected with those who benefit from our science. In turn, this will let us identify new customers and innovative ways of applying our expertise to emerging problems, creating new opportunities to provide additional research and science services.

What we need to do

Co-design solutions that solve customer problems and identify future needs in the public health, environment and justice systems.

What we are doing

Developing methodology and processes to help our staff engage in an authentic and meaningful way with our customers, iwi and communities.

Future key initiatives

During the next financial year (FY22) and beyond, we will establish and implement a customer-centric methodology and associated processes and systems. These will focus on developing science innovation into tangible problem-solving services and products that deliver realisable value to our customers.

Understanding our value: key initiatives and performance measures

Government priorities	Key initiatives FY21 to FY22	Performance measure	FY21 forecast	FY22 target
Building strategic relationships	Develop a customer insights strategy with an action plan to support customer engagement, co-creation and innovation	Establish and embed methods and systems that enable a pipeline of innovative science ideas to deliver services and products for customers	New measure	Achieved
	Increase knowledge, understanding and partnering with key government agencies	Partnerships are demonstrated by collaboration and co-design with Ministry of Health, Ministry for Primary Industries, Plant & Food Research and the New Zealand Police	New measure	Participation by each entity in at least one major service and / or product co-design



Shaping the future of our science

“Remaining relevant and building trust in science and scientists by ensuring the aspirations and needs of our customers, iwi and communities’ are met”

To ensure our science remains relevant and leading edge, we will focus on where we can make the most difference now and in the future. ESR has a strong reputation as an influential and innovative leader across the science ecosystem, solving problems for customers, iwi and communities in a dynamic environment.

What we need to do

Embed a systems thinking and social science approach to our research that will shape and transform our science. In addition, we will integrate digital research and data science and create research plans that are prioritised, multi-dimensional with a perspective of Te Ao Māori.

Work with customers, iwi and communities, allowing them to define their priorities, so we can provide our expertise to resolve their issues. Our new approach is a step-change in science delivery that ensures our work remains relevant and impactful.

What we are doing – our key initiatives

Data science

We are increasingly using data scientific methods, processes, algorithms and systems to extract knowledge and insights from structured and unstructured data and applying this knowledge and actionable insights to inform decision-making. By establishing greater data science capability, we will be able to better understand the causal effects that can lead to improved health and wellbeing outcomes for our customers, iwi and communities.

Future key initiatives

Genomics-first approach

In the near future, genomic data sources will be increasingly governed by people and communities, and ESR will adopt and help develop these federated data approaches.

Building on our successful COVID-19 response, we will be adopting a “genomics-first approach” where genomics will be the test of choice for all samples of infectious diseases. Genomic technology will be deployed “closer to the people” within communities, leading to a increased understanding of the environment, as well as in clinics with direct impacts in the clinical setting.

Genomics will still be important in a research setting but this will evolve and rapidly integrate into more applied settings, for example, being used to detect different human diseases like cancer, infectious diseases, rare disorders and antimicrobial resistance (AMR). We will see the technology and tools developing, leading to an increased use of genomics by diagnostics laboratories.

ESR will be well positioned to consolidate the information collected by diagnostic laboratories and to provide a surveillance service to the Ministry of Health on data gathered. We will continue to increase our collaboration with international partners on the use of genomics for human health, leading the response from a New Zealand perspective.

Increasing Māori collaboration and partnership

He Wai Māpuna is a new programme of work for ESR. Its aim is to deliver high-quality, Māori-led, Mātauranga-based, science-supported solutions, advice and expertise related to wai with iwi and hapū partners.

Wai is central to the wellbeing of Māori, and recognising this, ESR has leveraged its considerable expertise in water-related science to deliver impact for Māori.

He Wai Māpuna is a culture shift in terms of our way of thinking and behaving. Moving ESR's culture to one that responds explicitly to the aspirations and needs of Māori communities and that makes the space for Māori to lead will take deliberate effort, change and investment.

Our strategy includes recruitment and development of staff throughout ESR to enable us to better understand the needs and deliver appropriate solutions with Māori. ESR is striving to be an employer of choice for Māori scientists and professionals. We are contributing to the advancement of young Māori through an internship programme and support of the Pūhoro programme aimed at advancing Māori leadership and capability to deliver a world-class science community. Closer relationships with the mana whenua of all of our science centres will support this objective as well as enhance ESR ability to provide impact with Māori.

Shaping the future of our science: key initiatives and performance measures

Government priorities	Key initiatives FY21 to FY22	Performance measure	FY21 forecast	FY22 target
Growing the Māori economy and improving social, environmental and cultural wellbeing by building strong partnerships with Māori	Māori-led research programmes	Number of iwi partnerships under the He Wai Māpuna programme	New measure	5 iwi
	Commitment to Māori participation and partnership within the research, science and innovation (RSI) system	Increasing Māori collaboration and partnership	Number of co-designed research projects	New measure
Increasing the diversity and quality of the RSI workforce, including growing excellence and collaboration in research activity	Māori data sovereignty	Māori data sovereignty programme established and under way	New measure	Māori data principles and practices established through Māori Data Leadership Group
	Strategic Science Investment (SSIF) funding allocation	Percentage of SSIF funding allocated to projects led by and / or co-designed with Māori	New measure	10% to 12%
	Uplifting Data Science and Development Capability	Number of data scientists employed full-time equivalents (FTE)	New measure	4 FTE



Increasing our impact

“Improving outcomes for our customers, iwi and communities through innovative science”

To increase the impact of our science, research and innovation requires continuous development of and focus on creating and expanding high-value research and science. We will grow ESR's reputation for innovative science by shifting from reactive idea generation to a deliberate focus on innovation, co-creation and impact as a core part of our identity.

What we need to do

Explore, develop and implement new approaches to the way we collaborate and innovate. We need a consistent and prioritised investment approach to increase our innovation and impact by understanding what our customers value and need. This will help us grow our reputation for research and science that has high public good benefits and generates commercial opportunities.

What we are doing – our key initiatives

In FY21, we started several work streams to improve our delivery of science programmes for commercial impact. We invested in science business development capability to support our scientists and also commenced a programme of upskilling our staff in the commercialisation of science.

Future key initiatives

During FY22 and beyond, we will conduct a review of ESR's commercialisation processes, systems, resources and capabilities.

Strengthening our business to realise customer value

Embedding strategic relationships with key research organisations will strengthen our ability to develop and deliver better applied science outcomes that our customers want. Further we will develop better capability to ensure our proprietary intellectual property is the basis upon which ESR can create a sustainable competitive advantage. The process of transforming science ideas into customer-based solutions allows us to create and nurture emerging innovation as well as new business opportunities.

Increasing our impact: key initiatives and performance measures

Government priorities	Key initiatives FY21 to FY22	Performance measure	FY21 forecast	FY22 target
Growing excellence and collaboration in research activity	Research collaboration	Number of international proposals submitted and accepted	New measure	3
		Overall success rate of external research bids	New measure	41%
	Strengthening ties with New Zealand universities	Number of universities with formalised collaboration arrangements	New measure	2
		Developing ESR's commercialisation approach	Review ESR's commercialisation approach and make recommendations accordingly	New measure
	If recommendations are accepted by the Senior Leadership Team and Board, commence implementation		New measure	Implementation commenced
	Upskill ESR's scientists in achieving impact through science commercialisation		New measure	At least 20% of science staff have participated in a science innovation workshop



Building our team

“Capable and engaged staff, strong, accountable leadership, and clear strategic direction”

Our people are vital to ESR's success. We must understand our workforce and leadership capabilities to continue to elevate our culture and performance and position ESR for the future. Building our team includes building our capacity and capability to engage meaningfully with iwi and improve outcomes for Māori and other key partners so they actively seek us out as a preferred science partner.

What we need to do

Embed an inclusive culture of mutual respect and trust with a true partnership approach to our work by investing and developing our people, Māori cultural capability and organisational leadership capabilities.

Elevate our culture, workforce and performance by designing our working environments to allow our people to more easily connect, collaborate and innovate.

What we are doing – our key initiatives

In the first half of FY21, we started to build our cultural and health and safety competencies. We completed a preliminary assessment of our workforce capability, focusing on the skills, needs and priority areas for future investment. So staff can support our flagship wai and kai research programmes, we started developing tools to equip them to engage in an authentic and meaningful way with iwi.

Our development programme includes options for all staff to better understand Te Tiriti o Waitangi (the Treaty of Waitangi), historical contexts for inequalities, tikanga and te reo Māori. A comprehensive and intensive learning programme, Te Pihinga, has been developed, and the first cohort of 20 staff is under way, with the intent to evolve and grow this offering across the whole of ESR.

We will continue to assess our organisational health and safety risks.

Future key initiatives

During FY22 and beyond, we will deliver a workforce capability framework and continue developing our cultural capability and engagement with iwi.

Refreshing He Pūtaio He Tāngata

Continued growth, building on the foundations of capability development and new programmes, are the focus of our strategy for increased impact with Māori. We will continue to embed training and initiatives into our organisational policies and operating procedures, creating the basis for enduring relationships with Māori and opportunities to support greater impact for Māori and their communities.

Developing our workforce

ESR is developing its workforce capability framework to ensure its workforce has the appropriate skills, attributes and development programmes to ensure success. Aligned to this, we will continue to embed the technology-based performance management framework, Te Kāpehu, which supports our people's development, aligning everyone's performance with ESR's strategy.

In coming years, our focus is on the digitalisation of all aspects of our people's employee experience.

Building our team: key initiatives and performance measures

Government priorities	Key initiatives FY21 to FY22	Performance measure	FY21 forecast	FY22 target
Increasing the diversity and quality of the Research Science and Innovation (RSI) workforce, including growing excellence and collaboration in research activity	Developing a workforce capability framework to assess workforce skills, development needs and priority areas for investment	Develop ESR's workforce capability framework	New measure	Workforce capability framework developed
	ESR employee diversity is reflective of New Zealand society	Establish employee diversity baseline and monitor	New measure	Baseline established
Commitment to Māori participation and partnership within the RSI system	Cultural capability: build cultural competency	Develop and implement Te Pihinga training programme	New measure	At least three cohorts have commenced the intensive Te Pihinga training programme
		Percentage of staff who have participated in The Wall Walk Māori and the Te Tiriti historical context training	New measure	≥ 80%
		Percentage of staff who have participated in introduction te reo courses	New measure	≥ 35%
		Refresh He Pūtaio He Tāngata	New measure	Refreshed programme commenced
Legal and governance obligations to protect and safeguard the lives of staff and the assets of the organisation	Improving ESR's health and safety processes and procedures	Health and safety critical risks reviewed and implement management framework	New measure	Critical health and safety risk assessment completed and management framework in place
	Improving the management of staff wellbeing	Establish and implement ESR's wellbeing strategy	New measure	ESR's Wellbeing strategy established and implemented



Building stronger foundations

“Embedding and strengthening our infrastructure, systems and processes by strengthening our collaboration partnerships”

To build a responsive and adaptable organisation that will continue to deliver high-value and high-impact research and services, we will have a strong and resilient foundation. This will be supported by the right physical and technological infrastructure to increase our business success.

What we need to do

Invest in and implement business support systems and processes that meet or exceed agreed criteria for success, which will improve and integrate our decision-making and elevate our applied science and research delivery.

Invest to improve our work environment to change the way we collaborate and innovate allowing us to respond to the changing environment.

What we are doing – our key initiatives

During FY21, we commenced several key initiatives to help us strengthen our physical and technological infrastructure, investing in new systems and tools, which will lead to improvements in our processes and decision-making.

Future key initiatives

During FY22 and beyond, ESR will focus on efficiency (automation, right sizing the back office) and effectiveness – doing more for less. This will ensure our infrastructure is fit for purpose, which will include investigating new opportunities for systems collaboration with other CRIs.

Current pan-CRI collaborations include the progression of a new ERP/HCM platform and engagement of a virtual chief information security officer (CISO).

We will continue to eliminate duplicate IT systems and moving key applications to the Cloud and will seek to implement a laboratory information management system. We will embed our business continuity and resilience plans.

Over the next few years, we will be delivering a number of major redevelopment and upgrading projects around New Zealand. This includes the Kenepuru Science Centre Redevelopment Programme with a focus on incorporating Te Rūnanga o Ngāti Toa Rangatira into the design and building, and embedding sustainability principles.

Working in partnership with Ngāti Toa Rangatira on this project will ensure the process embodies the principles of Mātauranga Māori and will result in the design direction accurately reflecting Ngāti Toa Rangatira, their connection to place and ESR's unique identity.

Building stronger foundations: key initiatives and performance measures

Government priorities	Key initiatives FY21 to FY22	Performance measure	FY21 forecast	FY22 target
Efficiently and effectively managing the Crown's investment in science, research and innovation	Deliver Investment Management Framework	Investment Management Framework is delivered and implemented	New measure	Investigation completed and Implementation under way
	Investigate and Implement an Enterprise Resource Platform (ERP)	Enterprise Resource Platform implemented	New measure	Investigation completed and Implementation under way
	Investigate and identify a replacement Laboratory Information Management system	A laboratory information management system identified and implementation under way	New measure	Investigation completed and implementation under way
Legal and governance obligations to protect and safeguard the lives of staff and the assets of the organisation	Improving ESR's strategic business resilience and continuity	Implement recommendations of the ESR resilience programme	New measure	Uplift ESR resilience from level 3 to level 4
	Review organisational policies to ensure all policies are effective and consistent with our He Pūtaio He Tāngata strategic aspirations	Policies are reviewed and updated	New measure	Review of policy structure completed, and four policies reviewed and implemented
All Crown agencies must ensure they have appropriate plans in place to secure and manage the information they hold	Technology roadmap: Developing a future IT operating model for ESR	Develop and implement a future IT operating model	New measure	Operating model implemented
	Technology roadmap: Security assessment – strengthening ESR's cyber security maturity	ESR's cyber security maturing rating is managed or enhanced	New measure	Improving against an established baseline
	Information management strategy: Develop an information asset register that provides an enterprise view of how and where information and data are managed, accessed and shared by ESR	The information asset register supports security and privacy risk assessments and informs the development of a revised disposal authority	New measure	Information asset register in place and governance framework across ESR's information and data assets implemented

Funding a healthier, safer and cleaner New Zealand

ESR's research projects and services receive funding from various sources, including the Strategic Science Investment Fund (SSIF).

We receive SSIF research funding through the Human and Environmental Health and Forensic Science platforms from the Ministry of Business, Innovation and Employment (MBIE). We submit research bids to apply for external funding from MBIE (Endeavour and other funds), the Health Research Council of New Zealand, New Zealand Food Safety Science Research Centre (NZFSSRC), Marsden Fund and National Institute of Justice and National Institutes of Health in the United States of America. We also self-fund our research from reinvested profits.

ESR provides contracted essential services and undertakes research in the four impact areas it contributes to:

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

Collaboration is crucial to our success in producing ethical and trusted research that increases our science capability, our reputation nationally and internationally and maximises our impacts. Many of our research projects involve partnerships with other science organisations, scientists and health care providers. To promote Māori wellbeing, we partner with Māori scientists and Māori organisations to advance and embed Mātauranga Māori (knowledge, wisdom and understanding); Kaupapa Māori (subjects, topics, policies and initiatives) and Tikanga Māori (values, practices protocols and beliefs) in our research and science. We use Te Ara Tika Guidelines in our research, to ensure it is designed to meet Māori ethics, is relevant and has clear benefits for Māori wellbeing.

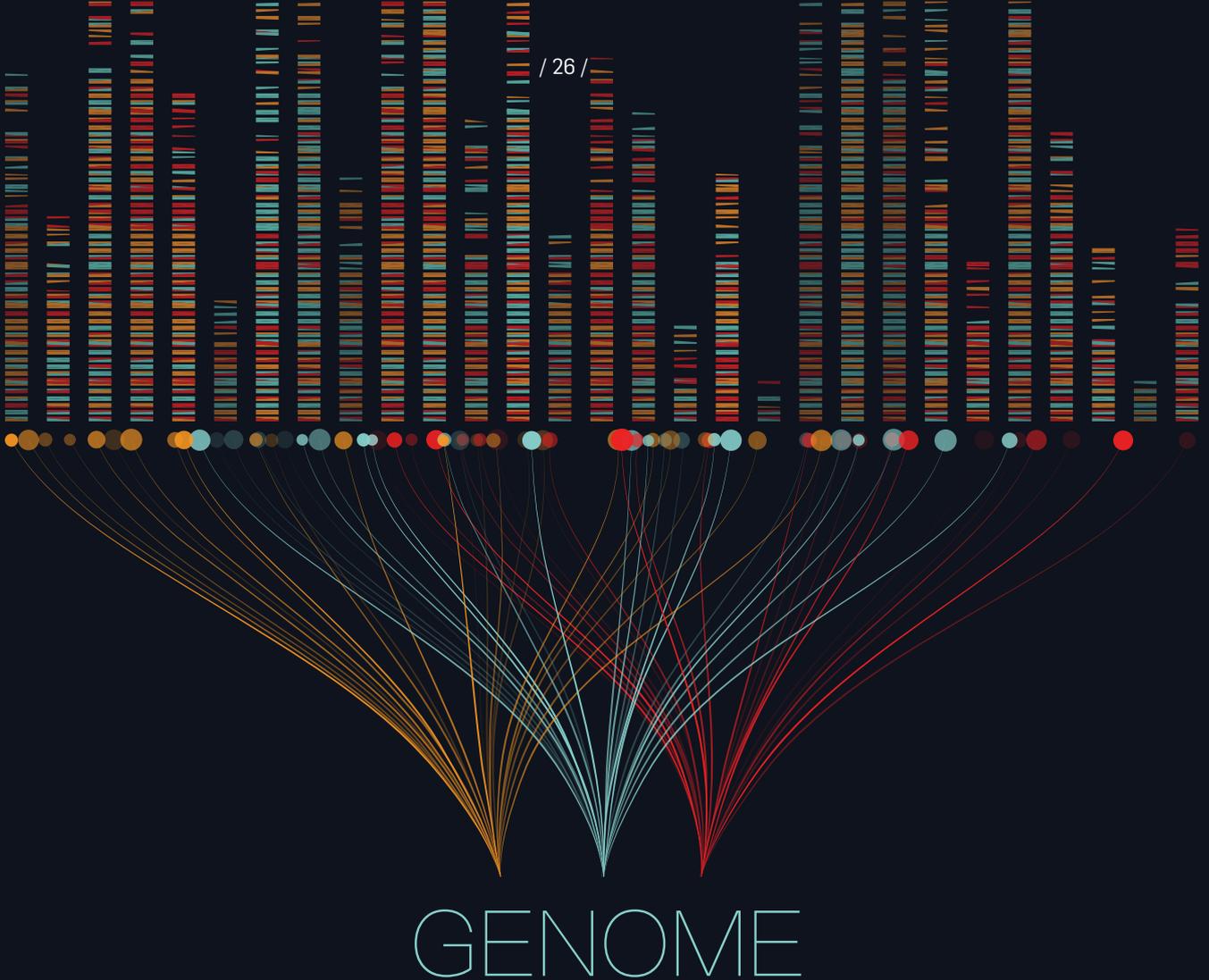


Strategic Science Investment Fund

The SSIF supports the research and capabilities that underpin our essential services. This ensures we can respond to and mitigate events that effect human and environmental health, provide forensic science services to the justice sector to improve community safety and wellbeing, and provide food safety services that protect and enhance the integrity of New Zealand's food-based economy.

Strategic focus areas

 <i>He Pūtaiao, He Tāngata</i>	 <i>Understanding our value</i>	 <i>Shaping the future of our science</i>
 <i>Increasing our impact</i>	 <i>Building our team</i>	 <i>Building stronger foundations</i>



Healthier communities

We contribute to safeguarding and enhancing the health of New Zealanders through improvements in the management of human biosecurity, threats to public health and addressing inequalities.

Health science vision

ESR will ensure New Zealand's scientific, epidemiological and clinical response capabilities in human health and public health surveillance remain effective, on par with international standards and are enhanced to manage existing and emerging public health threats. We will provide insights and solutions to counter the spread of notifiable and non-notifiable communicable diseases. Our solutions will inform public health and environmental health policies. We will provide response measures to public health and environmental health threats and issues. We will also partner with Māori to co-design and develop culturally appropriate solutions that benefit Māori hauora.

Research focus, priorities and projects

Our research focuses on whole genome sequencing of bacteria and viruses, human genomics, influenza, groundwater, and wastewater epidemiology. We are using data science to support health surveillance decision-making, early disease intervention and water quality. Our aim is to develop and increase our science capabilities by continuing to integrate genomics, bioinformatics and data science across our research and services. Our research results and services aim to improve public health outcomes.

Human genomics is the understanding of how each gene interacts with itself and other genes, as well as a person's environment. It includes the scientific study of complex diseases (such as cancer and heart disease) because these are caused by a combination of environmental and genetic factors rather than genetics only. Genomics offers the potential for new diagnostic methods to be developed. Whole genomic sequencing helps researchers uncover whether new genetic variations are linked to health conditions. This has important implications for reducing major diseases and improving health outcomes.

Human and environmental health impacts

Safeguarding the health and wellbeing of New Zealanders.

Critical issue	Key activities	Outputs	Outcomes	Strategic focus areas
Clinically relevant human genomics at ESR				
Identify effective ways to diagnose, treat and prevent illness using genomics	<p>Identify DNA variants associated with hyperparathyroidism</p> <p>Report results to our clinical partner, patients, and the communities</p>	<p>Improved clinical care by understanding the biological basis of disease</p> <p>Improved tools for clinicians and health care professionals to interpret clinical genomic data for positive treatment decisions</p>	<p>Increased engagement with clinicians, health care professionals, Māori communities, and researchers in human genomics nationally and internationally that supports their use and understanding of genomics and empowers clinical decision making</p> <p>Targeted interventions that reach more Māori and Pasifika</p>	  
Applying epigenomics and social systems approaches to improving the metabolic health of New Zealanders				
Improve patient outcomes for obesity, type 2 diabetes, and other metabolic disorders	<p>Identify DNA methylation and sncRNA biomarkers associated with metabolic disease, including obesity and type 2 diabetes</p> <p>Understand how perspectives on scalability from Māori providers and funders can support increased community-led programmes</p>	<p>Increased participation in the National Science Challenge Healthier Lives – He Oranga Hauora</p> <p>Findings published in peer reviewed journals</p> <p>Present findings at scientific conferences</p> <p>Improved tools for clinicians and health care professionals to identify the right treatment for a patient, and the right intervention for the population with respect to metabolic disease</p>	<p>Strengthened ESR's reputation in human genomics</p> <p>Strengthened national and international relationships including a focus on Māori and Pasifika communities in the area of metabolic disease</p> <p>Targeted interventions that reach more Māori and Pasifika</p>	   
Social systems laboratory				
Ensure our science aligns with community's needs	<p>Create a space where research, systems thinking, and external partners come together to collaboratively understand problems and co-design solutions enabled by:</p> <ul style="list-style-type: none"> • structuring complex problems • method and process development • networking and relationships development 	<p>Build capability for researchers to engage, design, and develop research for impact</p> <p>Methods and processes developed for applying systems thinking and co-design practices</p>	<p>Application of systems thinking to better engage and collaborate with communities and researchers across-disciplines</p> <p>Increased knowledge and interest in science leading to stronger engagement with Māori and communities</p>	  

Human and environmental health impacts

Safeguarding the health and wellbeing of New Zealanders.

Critical issue	Key activities	Outputs	Outcomes	Strategic focus areas
Social media observatory				
Enable proactive response to a disease outbreak	Develop a social media observatory from a variety of data sources, using data science capabilities to create near real-time interactive dashboards to monitor disease outbreaks	An early warning system for disease outbreaks that combines traditional surveillance methods with social media	Early detection and mitigation of health risks through near real-time public health surveillance and faster decision-making by using Interactive dashboards Better informed public health decision making	 

RNA concussion

Develop ability to identify a sport-related concussion (SRC) diagnosis immediately after an incident	Investigate for ribonucleic acid (RNA) markers that can be used as a quick and reliable method (using PCR or probe-based assay or a hand-held device)	Identification of RNA markers in saliva to confirm an SRC	Early detection of concussion and mitigation of associated health related risks and reduction in health maintenance costs Improved post-injury and rehabilitation options	 
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Human and environmental health impacts

Improve the safety of freshwater and ground water resources for human use and the safer use of biowaste.

Critical issue	Key activities	Outputs	Outcomes	Strategic focus areas
Ground water remediation the pathway to cleaner water for New Zealand				
Develop effective techniques to remove nitrate in ground water from intensive agriculture polluting fresh water	Expand the scale of the woodchip denitrifying bioreactor experiment to field sites at Silverstream and Barkers Creek Engage with relevant Māori communities and work closely with He Wai Māpuna project to engage with other Māori communities	Apply the woodchip bioreactor methodology to other contaminants such as phosphorous, pathogens and sediment	Engaged agricultural community remove nitrates from water systems Enable Te Mana o te Wai to be upheld – the health and wellbeing of New Zealand’s water systems are protected	   

Human and environmental health impacts

Safeguarding the health and wellbeing of New Zealanders.

Enhanced protection of New Zealand's food-based economy through the management of food safety risk associated with traded goods.

Improve the safety of freshwater and ground water resources for human use and the safer use of biowaste.

Critical issue	Key activities	Outputs	Outcomes	Strategic focus areas
ESR in the Māori economy				
Increase Māori participation in, engagement with and understanding of the value and utility of the science system	Invest and support Māori led science capability development initiatives, internships, scholarships and engagement programmes Actively respond to requests for support from Māori communities	Develop engagement tools, practice and frameworks with Māori	An engaged network of Māori communities that understand ESR's capabilities Increased partnership with ESR as a partner of choice for Māori communities in its expert domain areas	  
Pathogenesis of <i>Campylobacter</i> using an intestinal organ-on-a-chip				
Determine which <i>Campylobacter jejuni</i> strains cause human illness	Establish human intestine model using a novel organ-on-a-chip technology Validate the ability of prototypic <i>Campylobacter jejuni</i> 81-176 strain to attach, colonise and invade the intestine-organ-a-chip model Investigate a discrete group of genetically well characterised isolates using intestine-chip technology to answer questions on pathogenic variability	Understand the pathogenesis of <i>Campylobacter</i> in a new model The organ-on-a-chip platform can be applied to numerous organs, scientific approaches, and disciplines	Establishment of the organ-on-a-chip technology to reduce the use of animals for determining how <i>Campylobacter jejuni</i> and other pathogens cause disease Identification of which <i>Campylobacter jejuni</i> stains are pathogenic to allow the development of mitigation strategies in the event of an outbreak Data generated from the organ-on-a-chip technology has the potential to support policy and regulatory decision making in food safety and public health	  



Safer communities

Increase the impact forensic science makes by ensuring the right science, at the right time and at the right quality, is accessible to support improved decision-making at all stages of the frontline policing and justice investigation processes.

Forensic science vision

We will develop and evolve our science to ensure our forensic expertise is timely and accessible at all stages of the system to inform decision-making that supports prevention, detection and resolution of crime. In partnership with stakeholders, we will develop, validate and implement rapid, point-of-care

solutions, together with high-end science research and consultancy, to ensure the right information is available at the right quality and time. ESR will provide a responsive and flexible approach to crime-scene science, and its forensic services and expertise will be in demand worldwide.

Research priorities and projects

Our research is targeted at expanding our science capabilities and developing new solutions that support our partners to meet their goals of protecting and keeping communities safer.

Forensic science impacts

More crime prevented and solved.

Critical issue	Key activities	Outputs	Outcomes	Strategic focus areas
Digital forensics				
Identify and apply digital technology and data science applications to improve efficiency, effectiveness, and accessibility of science	Develop ESR's digital forensic capability	ESR adds digital services to its service provider of choice status to the justice sector	Improved detection, response, and resolution of pathways of crime	  
	Identify data sets that can be used to develop prototype workflows	A framework of ethical principles applied to the use of artificial intelligence and machine learning (AI/ML) in a forensic context	New Zealand's criminal justice system is more efficient and effective	
	Prioritise and co-design digital forensic technology with end users	<p>A repeatable machine learning operations (MLOps) pipeline is created</p> <p>Machine learning tools developed for use by the justice sector</p>		
Forensic genomics				
Understand how next generation sequencing provides improvements to the identification and delivery of intelligence from DNA	Develop and validate new DNA analysis techniques that improve and expand the information available from DNA samples	Delivery of a new intelligence service	New capability in the analysis of complex samples for justice sector users	  
	Develop data analysis pipelines to provide reliable outputs	New DNA analysis techniques validated and available to support case resolution	Improved detection, response, and resolution pathways of crime	
	Generate forensic validation documentation to support accreditation		New Zealand's criminal justice system is more efficient and effective	
	Understand genomic data sovereignty and ownership			
Vaping products in New Zealand				
Understand the impacts and risks associated with vaping	Investigate the current market and environment for vaping products	Increased knowledge of vaping products for sale in New Zealand as well as the chemical and biological components of vaping liquids	Enable evidence informed decision making by Ministry of Health and Māori health agencies	 
		Increased ability to analyse all aspects of vaping liquids and the "vape"	<p>Early detection and mitigation of health risks associated with vaping</p> <p>Reduced health and social inequity associated with vaping</p>	

Forensic science impacts

More crime prevented and solved.

Critical issue	Key activities	Outputs	Outcomes	Strategic focus areas
Systemic innovation in sexual violence case response				
<p>Improve the ecosystem of services and support groups related to responding and preventing sexual violence</p>	<p>Identify possible leverage points where ESR can make an impact including:</p> <ul style="list-style-type: none"> • testing methodologies for forensic intelligence • enhancing the medical examination kits process; • co-designing further prototype opportunities across Medical Sexual Assault Clinicians Aotearoa (MEDSAC), NZ Police and the justice sector 	<p>Enhanced existing and develop new relationships across sexual assault response and prevention "system"</p> <p>Realised efficiencies within the medical examination kits, data management and testing processes</p>	<p>Fast electronic results for Doctors, NZ Police, and the courts resulting in a better outcome for victims</p> <p>Provision of better support for those who have, or suspect they have, been victims of sexual violence with enhanced therapeutic and justice outcomes</p> <p>Improved health and wellbeing of the victim and family</p> <p>New Zealand's criminal justice system becomes more efficient and effective</p> <p>New Zealanders have confidence in the criminal justice system</p>	 
Bayesian networks: Evaluative reporting for forensic science				
<p>Supplement forensic evidence through the provision of statistical data to answer critical investigative questions</p>	<p>Develop statistical expertise in designing and populating Bayesian networks</p> <p>Develop models for firearms evidence</p> <p>Develop models linking body fluid identification to DNA profiles</p>	<p>New capability in statistical reasoning and transforming data, into insights</p>	<p>Strengthened core capability in evidence interpretation</p> <p>Increased knowledge enabling decision-makers to make more informed decisions in the judicial process</p> <p>New Zealand's criminal justice system is more efficient and effective</p>	 

Forensic science impacts

More crime prevented and solved.

Critical issue	Key activities	Outputs	Outcomes	Strategic focus areas
Biosensing illicit drugs in oral fluid for workplace and roadside testing				
Improve detection of illicit drugs	Develop a real-time, field deployable biosensing technology platform based on DNA aptamers to detect illicit drugs	<p>Provision of a framework to develop a hand held portable device for roadside detection of illicit drugs for use:</p> <ul style="list-style-type: none"> • by NZ Police to detect impaired drivers at the roadside • within workplace drug-testing environments <p>New technology product applied to other molecular targets, for example bacterial contaminants (<i>Listeria</i>), wastewater and soil testing</p>	<p>Application of the portable device as an on-site drug testing product across a range of sectors</p> <p>Early detection and mitigation of health risks associated with illicit drugs</p> <p>Support objectives of Alcohol and Other Drug Treatment Courts /Te Whare Whakapiki Wairua</p>	  
Unravelling the toxic effects of synthetic cannabinoids				
Understand the toxic effects of and harm of synthetic cannabinoids and other new psychoactive substances	Develop an <i>in vitro</i> and <i>in silico</i> (computational) framework for determining the relative harm of new drugs as they emerge on the market	<p>Identification of distinct molecular interactions responsible for the mode of action and toxicity with synthetic cannabinoids that leads to new directions in drug treatment therapies, harm reduction and policy development</p>	<p>Development of a drug-harm framework from data generated will inform an integrated drugs surveillance system</p> <p>High scientific value in advancing molecular and pharmacokinetic knowledge of synthetic cannabinoids</p> <p>Early detection and mitigation of health risks associated with synthetic cannabinoids</p>	 



Safer food

ESR's role in New Zealand's food safety system spans all food science research and services. We provide risk analysis and laboratory services directly to the Ministry for Primary Industries, to help regulatory food safety policy development and manage incidents.

We play an important role in food safety by using our microbiology, chemistry, data science, social systems and risk-assessment expertise to investigate and respond to food safety issues. We help industry and regulators to manage food safety and quality risks associated with traded goods and food collected in the wild (mahinga kai). Our food safety research, services and advice make a significant contribution to protecting and enhancing the integrity of New Zealand's food-based economy.

Food science vision

We use world-leading scientific knowledge and technologies to reduce risks from chemical and microbiological hazards in food, including mahinga kai.

We achieve our vision by:

- supporting and partnering with other government, research and industry organisations in New Zealand and overseas, in research to improve food safety, protect the quality of New Zealand's food, and prevent the harm caused by foodborne illness. We often collaborate with these partners via the NZFSSRC.

- using our research to investigate, diagnose and monitor bacterial, viral, chemical, physical, and radiological hazards across various on-farm and in-plant sources of food contamination. Our science is critical for providing robust and sound scientific evidence and advice to inform responses to foodborne disease outbreaks.

Our research focuses on developing new knowledge and technologies to meet the needs of New Zealand's food economy, including:

- developing a national reference capability for whole genome sequencing and analysis of foodborne pathogenic micro-organisms
- investigating and trialling rapid methods to detect pathogenic micro-organisms
- researching novel interventions for control of foodborne pathogens
- examining the impacts of the global rise in antimicrobial resistance
- determining the potential effects of climate change on food system hazards
- conducting surveys for chemical hazards in foods and undertaking human exposure assessments.

Through our research and services, we aim to reduce the risk of contaminated food and improve public health. ESR's work contributes to protecting New Zealand's food economy by helping ensure food safety risks are managed, new food safety issues are prevented and the health of New Zealanders is protected.

Human and environmental health impacts

Safeguarding the health and wellbeing of New Zealanders.

Critical issue	Key activities	Outputs	Outcomes	Strategic focus areas
GenomESR: Advancing genomics for food safety				
Identify food borne pathogens in complex food processing environments	Implement source attribution for research projects to inform investigation of sporadic and outbreak isolates Establish database to store metagenomic data	Grow ESR's: <ul style="list-style-type: none"> genomics reputation (<i>Listeria</i>, <i>Yersinia</i>, Shiga toxin-producing <i>Escherichia coli</i>, <i>Cronobacter</i> and <i>Salmonella</i>) national capability for whole genome sequencing of foodborne pathogens 	Improved food safety and quality for the food export market by providing a whole genome sequencing service for foodborne pathogens Reduced commercial risk by providing confidence in the safety of New Zealand food exports	  

Human and environmental health impacts

Enhanced protection of New Zealand's food-based economy through the management of food safety risk associated with traded goods.

Critical issue	Key activities	Outputs	Outcomes	Strategic focus areas
Mahinga kai				
Increase the safety of mahinga kai resources for whānau, iwi and hapū through co-development of tools combining Mātauranga and Western science	Deliver high-quality Mātauranga and Western science tools related to mahinga kai safety with iwi and hapū	Develop mahinga kai tools with iwi and hapū	<p>A scalable mahinga kai assessment framework available for adoption and adaption by iwi and hapū</p> <p>Iwi and hapū confidently monitoring their mahinga kai resource requesting help with testing from ESR as required</p> <p>Increased partnership with ESR as a partner of choice for ensuring safety of mahinga kai</p> <p>Acknowledged by Māori as a significant contributor to integrated science development and application for safety of Mahinga kai</p>	  



Cleaner water and environment

Water quality plays a vital role in the wellbeing of everyone. Through ESR's water research, we are committed to improving the quality and safety of drinking water, surface water and groundwater resources for human use, including the safer, sustainable management of wastewater. We ensure our solutions have a sound scientific base, enduring stakeholder support and are culturally appropriate.

Water and environment science vision

We aim to protect the health of New Zealanders and their environments. Our science contributes to healthier wai, healthier people, safer drinking water, safer recreational water and safer mahinga kai. We recognise the importance of wai for tāngata whenua and increasingly partner with Māori to incorporate Mātauranga Māori and the impact on Māori in our science delivery.

We will use our knowledge and research to develop enhanced technologies and solutions for source water protection and to improve the quality, management

and regulatory oversight of drinking water, rivers, streams, and groundwater. We will work with communities towards a circular economy where the harmful impacts of waste are minimised, while maximising reuse and resource recovery from waste. We use wastewater to extract knowledge and understanding of the health, wellbeing, and behaviours of our New Zealand communities.

Research focus, priorities, and projects

Our research focuses on the quality and safety of New Zealand's water systems, including groundwater modelling and mitigation methods, wastewater epidemiology and the effects of biowaste and microplastics on the environment. The research aims to reduce environmental threats to water systems and supplies and groundwater, and to build our science capability in these areas.

Our research also supports collaborative Kaupapa Māori community development of drinking water and wastewater projects and Mātauranga Māori in environmental decision-making.

Human and environmental health impacts

Improve the safety of freshwater and ground water resources for human use and the safer use of biowaste.

**Strategic
focus
areas**

Critical issue	Activities	Outputs	Outcomes	Strategic focus areas
Groundwater Health Index: a 2020 vision				
Understand the resilience of groundwater to contamination (physical and chemical)	<ul style="list-style-type: none"> Identify organisms capable of contaminant removal Develop a sampling method for groundwater ecosystems assessment Monitor groundwater sites for eDNA, biofilms and microbial to macrofauna Develop a toolbox for ground water quality Engage with relevant Māori communities 	<ul style="list-style-type: none"> Development of a groundwater quality assess and prediction toolbox of land-use impacts on groundwater quality Publications and presentations on groundwater ecosystem function and its role in maintaining clean, safe drinking water 	<ul style="list-style-type: none"> Improved description of groundwater systems for water quality assessment and predictive tools for land-use impact assessment Accurate assessment by regional councils of groundwater ecosystem function 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 	   
New Zealand native ecosystems for improving water quality and reusing biowaste				
Generate evidence for safe and sustainable use of biowaste	<ul style="list-style-type: none"> Desk-top laboratory and field-scale experiments undertaken to understand how native plants can work to improve water quality and treat biowaste Grow understanding and collaboration opportunities to position impacts to support Māori communities 	<ul style="list-style-type: none"> Provision of end-user advice, publications of reports and guidelines into native plantings The environmental risks and benefits of reusing biowaste with native plants are better understood 	<ul style="list-style-type: none"> Flagship management of environmental problems programme based on community participation and co-learning Biowaste reused through the use of native plants to ensure minimal risks to water quality of public health Recovered local biodiversity and increased participation and responsibility for environmental management Enhanced values of low-productivity land through effluent attenuation, carbon sequestration, resilience to drought, native biodiversity, economic revenue and income diversification 	   

Human and environmental health impacts

Improve the safety of freshwater and ground water resources for human use and the safer use of biowaste.

Strategic
focus
areas

Critical issue

Activities

Outputs

Outcomes

Novel food-grade pathogen surrogates

Develop safe and representative tools for investigating pathogen attenuation and transport in freshwater and assessing water treatment effectiveness in pathogen removal

Develop novel surrogates using food-grade biopolymers for *Cryptosporidium* and rotavirus

Validate the surrogates in a range of environmental matrices

Demonstrate usefulness of surrogates in real world with end-users

Creation of new tools for investigating pathogen mobility and persistence in water systems

Findings published in peer reviewed journals

Presentation of findings at scientific conferences

Improved ability to predict pathogen contamination than the traditionally used *Escherichia coli* faecal indicator bacteria

Introduction of a new approach to assess water treatment performance and pathogen attenuation and transport in freshwater

Reduced environmental impact resulting in improvements in water quality

Novel food-grade pathogen surrogate technology is extended to other pathogens



Contamination in our water: where's it from, what's there and what's the risk?

Identify sources of faecal material in water through biomarkers

Collect faecal sources, build eDNA faecal library and database

Develop metagenomic analysis of faecal source attribution in aquatic environmental samples

Validate qPCR assays: sensitivity and specificity

Create new faecal source tracking (FST) and pathogen qPCR tests ready for inclusion in our commercial FST services toolbox

Grow understanding and collaboration opportunities to position impacts to support Māori communities

Add metagenomic faecal source tracking to the FST toolbox

Develop a nationally recognised database of eDNA microbial community analyses in faecal reservoirs

Findings published in peer reviewed journals

ESR recognised as an expert authority on matters of faecal contamination and resultant infectious diseases in water environments



He Wai Māpuna

Increase Māori participation, leadership, and application, of water-based knowledge in water science aligned to Māori aspirations

Deliver high-quality Māori-led, Mātauranga-based, science-supported solutions, advice and expertise related to wai (water) with iwi and hapū partners

Establish both an immediate workplan of projects and longer-term jointly held goals with five iwi

Continued engagement with existing iwi and current work programme expanded to other iwi

New areas of research established that combine Mātauranga Māori and Western science

Māori communities realising their aspirations through active engagement in Mātauranga and Western science-based research

Iwi are defining and leading large research programmes with ESR



Human and environmental health impacts

Improve the safety of freshwater and ground water resources for human use and the safer use of biowaste.

**Strategic
focus
areas**

Critical issue	Activities	Outputs	Outcomes	Strategic focus areas
Antimicrobial resistance in wastewater				
Understand the role wastewater plays in the antimicrobial resistance (AMR) landscape in New Zealand	<p>Develop a trio of methods to understand AMR in wastewater specific to:</p> <ul style="list-style-type: none"> • prescribed drugs (antimicrobials) • detecting AMR organisms • whole metagenomics to identify gene presence specific to AMR <p>Apply methods to wastewater, to identify environmental sources of antibiotic resistant bacteria and AMR genes</p>	<p>Creation of tools to collect and analyse samples to better understand AMR and inform decision-makers</p> <p>Publications and presentation of appropriate application of this science in New Zealand</p>	<p>Reduced environmental, health and wellbeing, and social impacts of antimicrobial resistance in wastewater</p> <p>Tools are used in public health surveillance to evaluate changes in society and impacts of policy and other regulatory interventions</p>	 
New models of wai				
The application of a Te Ao Māori lens for developing new water and waste management systems	<p>Investigate tikanga guided frameworks for management of wai and parapopi toward a circular economy</p> <p>Explore and make use of natural systems to recover resources from water and biowaste</p> <p>Investigate social cultural and metabolic pathways for reducing chemical and biological contaminants</p>	Increase capacity and visibility of biowaste research in current kaupapa of ESR	Broader understanding of the current water and biowaste management systems leading to improved policy and regulatory decision-making	   
Securing New Zealand groundwater supplies				
Mitigation of the degradation of ground water quality nationwide	<p>Develop new methodologies to quantify the processes that control the movement and transport of pathogens and contaminants in New Zealand's aquifers using a combination of merging machine learning and numerical tools</p> <p>Apply novel DNA tracers for aqua characterisation purposes</p>	New methodologies and visualisation tools for contaminant hydrology applications	<p>Empower Māori communities to make informed decisions for managing groundwater resources</p> <p>Regional Councils and Unitary Authorities use the tools developed in the management of their water resources</p>	   

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

Generic performance measures

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

Government priorities	Strategic focus area	Performance measure	Purpose	FY20 Actual	FY21 Forecast or target	FY22 Budget or target
Growing investment in research, science and innovation.	Building stronger foundations	End-user collaboration: revenue per full-time employee (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	\$157,700	\$142,300	\$139,300
	Building stronger foundations	Financial indicators: revenue per FTE	Amount of revenue per FTE	\$208,800	\$188,000	\$185,000
Effective and efficient investment practices	Shaping the future of our science	Science quality: impact of science publications	Impact of science publications (measured using web of science citations for the previous calendar year)	3.6	3.5	3.8
	Increasing our impact	Research collaboration: publications with collaborators	These refer to publications prepared in collaboration with authors at other New Zealand institutes and / or international authors	74	70	75
	Understanding our value	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	0.35	0.36

Supplementary performance measures

We have identified additional performance measures to track our progress against our strategic focus areas.

Government priorities	Strategic focus area	Performance measure	Purpose	FY20 Actual	FY21 Forecast or target	FY22 Budget or target
Effective and efficient investment practices	Building stronger foundations	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	2.19	2.63	Between 2.7 and 2.8
		Total commercial revenue	Measuring growth of ESR's commercial revenue	\$63.2m	\$68.0m	\$73.1m
Legal and governance obligations to protect and safeguard the assets of the organisation	Building stronger foundations	ESR maintains a consistent audit rating	To provide transparency of ESR's audit rating	Good to very 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	Shaping the future of our science	Number of doctoral theses examined, and number of postgraduate students supervised by ESR scientists	Indicates the quality of ESR's scientists	New measure	New measure	Between 8 and 10

Appendix 2: Additional financial indicators

The financial assumptions reflected in this SCI present a significant improvement over the view held 12 months ago. While the ongoing economic impact of COVID-19 in New Zealand and globally remains uncertain, the domestic economy has rebounded more quickly than anticipated and the recent development and rollout of vaccines around the world has resulted in a more positive outlook for the global economy.

Demand for ESR's science services increased in FY21, particularly from the health sector, with service delivery and research revenues outperforming our 2020 Statement of Corporate Intent expectations. The main component of this improvement has been the provision of services to the Ministry of Health in support of the Government's response to the COVID-19 pandemic. This level of activity is expected to come to an end in FY22, resulting in a 3 percent reduction in total ESR revenues in FY23.

ESR expects to be able to complete the renegotiation of core government contracts over FY21 and FY22, putting these agreements on a sustainable financial basis.

Moderate research revenue growth is expected to continue over the SCI period. This reflects and builds on recent activity in the health sector, increased funding from overseas sources, particularly in the influenza research area, and investment in science staff.

Overall, commercial revenues have held up during FY21 and are expected to improve over the next three years as international borders open up and the global economy recovers. ESR is expecting increased revenue from the sale of STRmix™ forensic software in North America, Europe and Asia as product development continues and new markets are established.

COVID-19 Response and Recovery Funding received from the Government in 2020 and 2021 has contributed to ESR's financial resilience, supporting capital projects and the development of personnel capacity and capability.

Progress on the replacement of the Kenepuru Science Centre has been made during FY21, with concept design to be completed before the end of the financial year. Detailed design will be completed during FY22 and construction will start FY23, if approved. The new facility is expected to be completed and occupied in FY26.

Following a system and vendor selection process undertaken in collaboration with GNS, ESR is replacing its Enterprise Resource Planning (ERP) and Human Relationship Management (HRM) systems. The implementation of the of the chosen system will also be done in collaboration with GNS and will largely be completed in FY22. The ERP/HRC solution selected is a cloud-based software as a service product and this requires system configuration and implementation costs to be largely expensed as incurred. This accounting treatment is driving the post-tax loss planned in FY22 and FY23 – excluding the cost of this investment ESR would be making a small post-tax profit in FY22 and a circa-\$200k post tax profit in FY23.

Cash reserves and operating cash flows are anticipated to be adequate to support the planned investment incorporated into the SCI, with recourse to short-term debt facilities not anticipated.

Dividend

It is not anticipated that ESR will have the funds available for distribution due to the planned investment in science capabilities and facilities

Financial performance indicators

The table below shows the key financial performance indicators for the three-year period FY22–FY24.

	FY22 SCI	FY23 SCI	FY24 SCI
Revenue (\$000s)	97,287	94,623	98,088
Revenue growth	3.2%	-2.7%	3.7%
Revenue per FTE (\$000)	185	181	185
Operating results (\$000s)			
Earnings before interest, tax, depreciation and amortisation	4,481	7,689	9,766
Net profit after tax	(2,500)	(46)	1,333
Liquidity			
Quick ratio (acid test)	2.3	2.3	1.6
Profitability			
Return on equity	-4.3%	-0.1%	1.8%
Operating margin	4.6%	8.1%	10.0%
Operating margin per FTE (\$)	8,500	14,700	18,400
Operational risk			
Profit volatility	36.2%	34.0%	36.4%
Growth/investment			
Capital expenditure (\$000)	14,612	17,959	36,767
Capital renewal	1.8	2.3	4.6
Dividend	-	-	-
Financial strength			
Gearing (debt*/debt and equity)	3.7%	2.6%	1.5%
Equity ratio (equity/total assets)	71%	75%	78%
Cash reserves (\$m)	24.8	24.4	12.4
<i>* Lease liabilities</i>			

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 our strategic priorities. We will focus on shaping our workforce to ensure we plan for and build capabilities that align with future needs. We will create more integrated initiatives and approaches to drive people capability development in a diverse, yet highly specialised, workforce. To increase the confidence and capability of all our staff to work with our Māori partners, we are implementing a Māori capability development programme.

Good employer obligations

At ESR, we value diversity and benefit from the knowledge and unique perspectives of a workforce that includes people of New Zealand European, Māori, Pasifika and Asian origin. Women represent nearly two-thirds (64 percent) of our employees and work at all levels and roles in our organisation.

We will continue to show our commitment to being a good employer and advocating organisation-wide equal employment opportunity practices relating to recruitment and selection, development, management and retention of staff. This will include a focus on ensuring Māori are aware of employment opportunities at ESR.

Accounting policies

A summary of our accounting policies is included in our Annual Report. The current Annual Report can be found on the website: www.esr.cri.nz/home/about-esr/corporate-publications/2020-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 (ESR's) forecast ratio of shareholders' funds to Adjusted Tangible assets is as follows.

Subsidiary	2021/22	2022/23	2023/24
Equity ratio	0.71:1	0.75:1	0.78:1

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 2020 is a fair and reasonable indication of the commercial value of the Group. The net asset position, as shown in accordance with the company's accounting policies for 30 June 2020, was \$58.96 million.

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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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



www.sciencenewzealand.org

3,800

SMART AND
PASSIONATE PEOPLE

54

SITES ACROSS
NEW ZEALAND

6,000

SCIENCE PROJECTS
EACH YEAR

40

NATIONALLY SIGNIFICANT
DATABASES & COLLECTIONS

A lush forest stream with moss-covered rocks and water. The scene is filled with vibrant green moss and ferns, with sunlight filtering through the trees. Three inset images on the right side of the page show close-up details of the moss and water.

Science Centres

Kenepuru Science Centre

34 Kenepuru Drive, Kenepuru, Porirua 5022
PO Box 50348, Porirua 5240, New Zealand

Mt Albert Science Centre

120 Mount Albert Road, Sandringham, Auckland 1025
Private Bag 92021, Auckland 1142, New Zealand

National Centre for Biosecurity and Infectious Disease (NCBID)

66 Ward Street, Wallaceville, Upper Hutt 5018
PO Box 40158, Upper Hutt 5140, New Zealand

Christchurch Science Centre

27 Creyke Road, Ilam, Christchurch 8041
PO Box 29181, Christchurch 8540, New Zealand