

A tropical beach scene with palm trees and blue water. The image is split diagonally by a blue triangle in the top right corner. The bottom right corner features a black triangle containing the ESR logo and a blue triangle containing the tagline.

# ESR IN THE PACIFIC

**E/S/R**

THE SCIENCE  
BEHIND THE  
TRUTH

# KEEPING PEOPLE SAFE AND HEALTHY THROUGH SCIENCE

**Hs**

Health  
science

**Fs**

Forensic  
science

**Ws**

Water  
science

**Wt**

Workplace  
drug  
testing

**So**

Social  
systems

**Rs**

Radiation  
science

**Fo**

Food  
science

ESR (The Institute of Environmental Science and Research) is a Crown research institute that uses the power of science to solve complex problems and provide expert and independent research and scientific services to our partners, clients and stakeholders.

We provide expertise across a wide range of disciplines including public health surveillance and biosecurity, drinking water surveillance, food science, emergency response, crime scene investigation, workplace drug testing, and radiation safety – all contributing to the economic, environmental and social wellbeing of people and communities in New Zealand and around the world.

ESR is the lead CRI in:

- ▀ surveillance of human pathogens and zoonotic diseases
- ▀ domestic and export food safety in partnership with the regulator
- ▀ impacts of the environment on human health, including groundwater, fresh and drinking water quality, wastewater and safe biowaste use
- ▀ integrated social and biophysical research to support decision making in the environmental, public health and justice sectors
- ▀ measurement and monitoring services, research capability and expert advice on ionising and non-ionising radiation
- ▀ forensic science services.

### **ESR'S FOCUS IN THE PACIFIC**

As a national resource of New Zealand, ESR is well-placed to assist the Pacific region with scientific expertise, information and tools to strengthen policy, programmes and practice to achieve healthy, safe and resilient communities.

ESR's focus in the Pacific is aligned with the New Zealand Aid Programme's strategic plan and investment priorities in agriculture, information & communications technology, fisheries, tourism, trade & labour mobility, law and justice, health, resilience and humanitarian response.

We work in partnership with regional organisations such as The Pacific Community (SPC), the World Health Organization (WHO), UNICEF, Pacific governments, not-for-profit organisations, and New Zealand CRIs and universities.



## RECENT AND CURRENT ACTIVITIES



### HEALTHY TONGA ENVIRONMENTS

Following on from our Healthy Tonga Tourism project, ESR is in the design phase of a New Zealand MFAT Partnerships for International Development Fund project that aims to strengthen the capability of Tonga's Ministry of Health environmental health team.

The project comprises four components: developing an environmental public health strategy, environmental health action plan and health inspector's manual; delivering a formal qualification to health inspectors backed up with on-the-job training, advice and mentoring; establishing an environmental public health laboratory; and developing a system for integrated environmental public health data storage, analysis and reporting.

**KEY CONTACT:**

**Matt Ashworth**

**E:** [matthew.ashworth@esr.cri.nz](mailto:matthew.ashworth@esr.cri.nz)



### SOLOMON ISLANDS BETTER LEARNING ENVIRONMENTS

Building on the partnership formed for the Kiribati WASH in Schools project, ESR has again partnered with UNICEF New Zealand to provide support to the MFAT Partnerships for International Development Fund Solomon Islands Better Learning Environments (SIBLE) project.

Based in the Guadalcanal Province, the project (currently in its design phase) will support policy, standards and guidelines development to mobilise schools and communities around the importance of better WASH (water, sanitation and hygiene) practices, install WASH facilities, and train students, teachers and committees to use and maintain the facilities.

ESR's contribution is to facilitate the development of the schools WASH technical support model (WASH Safety Planning), including: consultation and participatory design on the support model description, guidelines for school-specific risk assessment and prioritisation, guidelines for maintenance and improvements to existing facilities and practices, process to select appropriate water and sanitation options, and ways to monitor for, avoid and respond to problems.

**KEY CONTACT:**

**Dr Jan Gregor**

**E:** [jan.gregor@esr.cri.nz](mailto:jan.gregor@esr.cri.nz)



### DEVELOPING FLAGSHIP CAPABILITIES

ESR is developing a suite of practical solution-oriented products, appropriate for the Pacific islands, to support decision-making, training, and daily or routine operations.

The first two products underway are a mobile phone-enabled data capture facility for recording drinking-water supply sanitary survey information, and a guide and process for conducting a national food safety programme needs analysis.

**KEY CONTACT:**

**Dr Jan Gregor**

**E:** [jan.gregor@esr.cri.nz](mailto:jan.gregor@esr.cri.nz)

## RECENT AND CURRENT ACTIVITIES



### **STRENGTHENING WATER SECURITY OF VULNERABLE ISLANDS STATES**

SPC Geosciences Division contracted ESR in 2014 to lead the consultation and writing of the project design document for the New Zealand MFAT-funded project "Strengthening Water Security of Vulnerable Islands States".

The project focuses on strengthening drinking-water security (availability, reliability and quality) in vulnerable and isolated communities of five countries: Cook Islands, Kiribati, Republic of Marshall Islands, Tokelau and Tuvalu. Between August and November 2015, ESR was contracted to provide technical support for country-level consultations, rapid assessments and implementation planning.

#### **KEY CONTACT:**

**Dr Jan Gregor**  
E: [jan.gregor@esr.cri.nz](mailto:jan.gregor@esr.cri.nz)



### **KIRIBATI WASH IN SCHOOLS**

ESR is a partner to UNICEF New Zealand for the New Zealand MFAT-funded project "Kiribati WASH in Schools". The UNICEF-led project aims to improve the water, sanitation and hygiene of 36 outer island schools in Kiribati.

ESR's role in the project is to provide a technical toolkit resource that will be used by the outer island schools to choose appropriate and affordable water, sanitation and hygiene options along with training in how to use the toolkit.

#### **KEY CONTACT:**

**Dr Jan Gregor**  
E: [jan.gregor@esr.cri.nz](mailto:jan.gregor@esr.cri.nz)



### **KIRIBATI CORAL SAND EFFLUENT DRAINAGE ASSESSMENT**

The New Zealand Ministry of Foreign Affairs and Trade contracted ESR in 2015 to evaluate the drainage and microbial removal properties of beach coral sand under controlled conditions for application as an active sand/aggregate in a septic tank drainage field on South Tarawa, Kiribati. This project is providing research recommendations to inform decisions on sanitation solutions that reduce negative environmental impacts.

#### **KEY CONTACT:**

**Bronwyn Humphries**  
E: [bronwyn.humphries@esr.cri.nz](mailto:bronwyn.humphries@esr.cri.nz)

## RECENT AND CURRENT ACTIVITIES



### A TECHNICAL ASSESSMENT OF EFFECTIVENESS OF CORAL SANDS AT ATTENUATING PATHOGENS

During 2013, ESR completed an internally-funded study of pathogen movement and retardation through the coral sands of Pacific low-lying atolls. Using a sample of coral sand gathered from the Bonriki groundwater reserve in South Tarawa in a lab-based column experiment, the microbial removal rates for the coral sand were found to rank towards the top-end of attenuation rates reported for natural porous media (like pumice).

The significance of this finding is starting to turn thinking on its head about the benefit, rather than the risk, of coral sand in protecting the freshwater lens from microbial contamination.

#### KEY CONTACT:

**Bronwyn Humphries**

E: [bronwyn.humphries@esr.cri.nz](mailto:bronwyn.humphries@esr.cri.nz)

DDI: +64 3 351 1234



### DETECTION OF PATHOGENIC ENTERIC VIRUSES IN FRENCH POLYNESIA

A project co-funded by ESR, the French Pacific Fund, *Centre d'Hygiène et de Salubrité Publique* (CHSP), *Direction des Ressources Marines et Minières* (DRMM), *Centre de Recherches Insulaires et Observatoire de l'Environnement* (CRIOBE), *Centre Hospitalier de Polynésie française* (CHPf) and the Luxembourg Institute of Science and Technology (LIST) has started in 2015 to monitor for the first time the presence of enteric viral pathogens in the environment of French Polynesia including wastewater, seawater and shellfish.

The study showed the presence of several enteric viruses in recreational waters, sometimes at alarming concentrations. Noroviruses were also found in giant clams (*T. maxima*) that are often collected and consumed by the population in French Polynesia.

Further tests are planned including the detection of infectious and intact human adenoviruses in seawater, the typing of human adenoviruses detected by high-throughput sequencing and metagenomic analysis of the viral diversity in wastewater samples.

#### KEY CONTACT:

**Dr Jérémie Langlet**

E: [jeremie.langlet@esr.cri.nz](mailto:jeremie.langlet@esr.cri.nz)



### GOPS: SOUTH PACIFIC INTEGRATED OBSERVATORY FOR ENVIRONMENT AND TERRESTRIAL AND MARINE BIODIVERSITY

The South Pacific is a natural laboratory for studying the effects of global change, analysing, modelling and forecasting extreme events, conducting experiments (in a variety of situations), existence of references, gradients) as well as testing theories on island biogeography and evolutionary biology. But the South Pacific is also a particularly vulnerable area (high population growth in small areas, intensive exploration of resources, development of invasive species, etc.).

For France, which has a long history in the South Pacific through its territories, this region is particularly strategic. Therefore, French universities and research organizations working in the South Pacific have come together to create in 2009 a regional integrated observatory, better known by its French acronym, GOPS: *Grand Observatoire de l'environnement et de la biodiversité terrestre et marine du Pacifique Sud*. GOPS' objective is to federate research activities in the South and West Pacific on the observations of environment and biodiversity impacted by global change and human activities, as well as to establish mutual resources between scientific organisations. In 2015, Jérémie Langlet was appointed member of the scientific committee of GOPS.

#### KEY CONTACT:

**Dr Jérémie Langlet**

E: [jeremie.langlet@esr.cri.nz](mailto:jeremie.langlet@esr.cri.nz)

## RECENT AND CURRENT ACTIVITIES



### HEALTHY TONGA TOURISM

ESR started a three-year NZ Aid Programme-funded project in 2012 supporting the tourism and health Ministries in Tonga to build resilience in Tonga's tourism sector through the introduction of public health risk assessment and management practices.

The focus was on extending the capability of Tonga's health inspectors and building up a set of practical checklists and guidance documents for each of the healthy services and physical environments that tourist accommodation businesses have a duty of care to provide to guests and staff.

Three guidelines were produced for accommodation businesses: safe rainwater harvesting; food safety and hygiene; and controlling mosquito-borne disease ([available from ESR website](#)).

#### KEY CONTACT:

**Dr Jan Gregor**

**E:** [jan.gregor@esr.cri.nz](mailto:jan.gregor@esr.cri.nz)



### PACE-NET+ THINK TANK

ESR was an invited expert to the November 2014 PACE-Net+ Bremen Conference and Think Tank "Enhancing community resilience: managing environment, water and wastes under changing climate", bringing experts from the EU and the Pacific to identify priorities and innovation areas for future joint EU-Pacific cooperation and activities and to provide recommendations to policy makers. PACE-Net+ (Pacific-Europe Network for Science, Technology and Innovation) is a three-year project, funded by the European Commission that strengthens bi-regional cooperation in ST&I between the Pacific and Europe, addressing a number of societal challenges.

#### KEY CONTACT:

**Dr Jan Gregor**

**E:** [jan.gregor@esr.cri.nz](mailto:jan.gregor@esr.cri.nz)



### UNEP EVALUATION OF PACIFIC IWRM PROJECT

The Evaluation Office of the United Nations Environment Programme contracted ESR to the evaluation team for the terminal evaluation of the Global Environment Facility project "Implementing Sustainable Water Resources and Wastewater Management in Pacific Island Countries". The project commenced in 2009 and concluded in early 2014. It comprised four components, including country-driven and designed demonstration projects, integrated water resources management (IWRM) and water use efficiency (WUE) regional indicator framework development, policy, legislative and institutional reform for IWRM and WUE, and regional capacity building and sustainability for IWRM and WUE.

#### KEY CONTACT:

**Dr Jan Gregor**

**E:** [jan.gregor@esr.cri.nz](mailto:jan.gregor@esr.cri.nz)

## RECENT AND CURRENT ACTIVITIES



### REGIONAL TRAINING COURSE ON SAFE TRANSPORT OF RADIOACTIVE MATERIAL FOR THE PACIFIC ISLANDS

ESR hosted a regional training course on safe transport of radioactive material for the Pacific Islands in May 2014, funded by the International Atomic Energy Agency (IAEA). The course was targeted at small Pacific Island States, and provided guidance and assistance to Pacific Island States, who have a current or future need to import/export radioactive material for routine medical diagnosis and treatment procedures (eg, cancer treatment), or for non-medical applications (eg, testing the moisture content of new roads).

#### KEY CONTACT:

**Cris Ardouin**

**E:** [cris.ardouin@esr.cri.nz](mailto:cris.ardouin@esr.cri.nz)



### DETECTION OF PATHOGENIC ENTERIC VIRUSES IN NEW CALEDONIA

Human enteric viruses are one of the leading causes for infectious gastroenteritis worldwide and norovirus is the most common foodborne virus in developed countries. Viruses are shed in extremely high numbers in the faeces of infected individuals. Humans are exposed to enteric viruses through various transmission routes: person-to-person, food crops grown in land irrigated with wastewater and/or fertilised with animal manures, sewage-polluted recreational waters, contaminated drinking water and shellfish grown in contaminated waters.

Occurrence of human enteric viruses has never been monitored in New Caledonia. In 2011, a co-funded project for the detection of viral enteric pathogens in New Caledonia occurring in humans and for monitoring viral contamination of environmental waters commenced. The project was co-funded by ESR, the French Pacific Fund, DASS-NC (Direction des affaires sanitaires et sociales), Pasteur Institute of Nouméa, and Province Nord of New Caledonia.

The study reported for the first time the presence of norovirus and other enteric viruses in New Caledonia and highlighted the year-round presence of enteric viruses in the seawater of a popular beach.

Faecal samples from cases of gastroenteritis were tested for the first time for norovirus and detected in the population. Most pathogenic enteric viruses, excluding hepatitis A virus, were found every month in high concentrations in raw wastewater. Overall, 92 % of seawater samples were positive for at least one virus at concentrations high enough to cause a public health risk.

#### KEY CONTACT:

**Dr Jérémie Langlet**

**E:** [jeremie.langlet@esr.cri.nz](mailto:jeremie.langlet@esr.cri.nz)

*Kaas, L., Gourinat, A. C., Urbès, F., & Langlet, J. (2016). A 1-Year Study on the Detection of Human Enteric Viruses in New Caledonia. Food and Environmental Virology, 8(1), 46-56.*

## RECENT AND CURRENT ACTIVITIES



### LINKS BETWEEN WATER QUALITY AND DIARRHOEAL DISEASE IN KIRIBATI

In support of the NIWA-led NZ Aid Programme-funded water quality monitoring capacity building project in Kiribati, ESR contributed a study to scope whether it is possible to estimate the chance of getting diarrhoeal disease from each of the various water sources (rainwater, lagoon water, reticulated water, private well water). The available range and completeness of health data was found to be inadequate, and not practical or affordable to gather what would be required. But a simplified Quantitative Microbial Risk Assessment (QMRA) approach was found to be a technically feasible option for Kiribati, making use of the water quality data for indicator bacteria that is starting to amass.

**KEY CONTACT:**

**Dr Jan Gregor**

**E:** [jan.gregor@esr.cri.nz](mailto:jan.gregor@esr.cri.nz)



### SCIENTIFIC AND PROFESSIONAL DEVELOPMENT ASSISTANCE TO NEW CALEDONIA

Since 2005, ESR has provided technical advice, training and mentoring to the New Caledonia DASS-NC (*Direction des affaires sanitaires et sociales*) in the development and implementation of its drinking-water quality management programme. ESR also designed an information system for water quality management that supports the programme. Some of the latter support has been in conjunction with the EU-funded 'Supporting Disaster Risk reduction in Pacific Overseas Countries and Territories' project, led by SPC-SOPAC.

ESR and NIWA contributed expertise to the New Caledonia Organisme partenarial de l'assainissement en Nouvelle-Caledonie (OPANC), which is considering how to reform the governance of New Caledonia's sanitation and wastewater arrangements.

**KEY CONTACT:**

**Dr Jan Gregor**

**E:** [jan.gregor@esr.cri.nz](mailto:jan.gregor@esr.cri.nz)



### DRINKING-WATER SAFETY PLANNING TRAINING AND POLICY DEVELOPMENT IN THE PACIFIC

Between 2006 and 2010, under contract to the WHO-SPRO/SOPAC collaboration on safe drinking-water, ESR contributed the design and delivery of interactive collaborative learning workshops in drinking-water safety planning to five countries (Tonga, Cook Islands, Vanuatu, Palau and Samoa). ESR also developed an information system for water quality management. ESR drew on its expertise and experience in providing advice to the development and implementation of the New Zealand drinking-water quality management programme.

In 2010 ESR delivered drinking-water safety planning training in Malaysia, and in 2011 delivered drinking-water safety planning training in Fiji, and drafted Fiji's National Drinking Water Safety Plan for Rural and Island Communities in Fiji' for the Ministry of Health of Fiji, under contract to the WHO-SPO.

In 2012 and 2014 ESR was contracted to DASS-NC and SPC-SOPAC to provide technical assistance to sub-regional learning events in drinking-water safety planning.

**KEY CONTACT:**

**Dr Jan Gregor**

**E:** [jan.gregor@esr.cri.nz](mailto:jan.gregor@esr.cri.nz)

## RECENT AND CURRENT ACTIVITIES



### **MOBILISING COMMUNITY-LED WATER SUPPLY, SANITATION AND HYGIENE IMPROVEMENTS IN FIJIAN VILLAGES**

WASH Koro (“clean village”) is a NZ Aid Programme-funded project led by NIWA that addresses provision of water supply, sanitation and hygiene (WASH) infrastructure in two ‘new’ rural villages in Fiji – Bavu and Namaqumaqua, building on the learning and capacity developed in the Wai Votua Project (2006–2010). It aims to provide self-help tools to mobilise communities to recognise and address their own water supply, sanitation and health/hygiene needs.



### **SUSTAINABLE COMMUNITY DRINKING-WATER AND WASTEWATER TREATMENT**

Between 2006 and 2010 ESR, in collaboration with NIWA and University of the South Pacific, provided public health risk assessment and health impact expertise to the Wai Votua NZODA-funded project that developed, tested and demonstrated sustainable community drinking-water and wastewater treatment solutions for the coastal Fijian village of Votua. The project used dialogue, capacity building and partnership-based processes to engage village communities, local government agencies, educational facilities and NGOs to ensure that the solutions developed were appropriate to the local situation and culture. The project incorporated traditional indigenous knowledge and approaches with those of western science and engineering, utilising local materials and resources wherever appropriate to build local capacity to address drinking-water, wastewater management and hygiene issues.



### **PACIFIC ISLANDS WATER-RELATED REGIONAL ACTION PLANNING**

Starting in 1999, ESR supported SOPAC and the WHO with Pacific regional consultations, action plan preparation and progress reviews for wastewater management (Pacific Wastewater Policy Statement and associated Pacific Wastewater Framework for Action, 2001) sustainable water management (Pacific Regional Action Plan on Sustainable Water Management, 2002) and drinking-water quality management (Pacific Drinking Water Quality and Health Framework for Action, 2005). The Pacific position is being revised into a single forward-looking Pacific Framework for Water, Sanitation and Climate, and ESR support this activity.

#### **KEY CONTACT:**

**Dr Jan Gregor**

**E:** [jan.gregor@esr.cri.nz](mailto:jan.gregor@esr.cri.nz)

## RECENT AND CURRENT ACTIVITIES



### PACIFIC PUBLIC HEALTH SURVEILLANCE NETWORK

The Pacific Public Health Surveillance Network (PPHSN) is hosted by SPC's Public Health Division. ESR is an allied member of the PPHSN which also comprises five allied members, three permanent regional representatives, WHO, and Fiji School of Medicine. In addition, ESR has supported regional initiatives like the Pacific Regional Influenza Pandemic Preparedness Project, and the regional Zika virus outbreak in 2015-2016. ESR has also provided epidemiological training in the Pacific, supplying CD-ROMs and other information.

**KEY CONTACT:**

**Dr Virginia Hope**

**E:** [virginia.hope@esr.cri.nz](mailto:virginia.hope@esr.cri.nz)



### ENTERIC REFERENCE LABORATORY

New Zealand's national reference laboratory for enteric bacterial diseases has provided a reference laboratory service for the Pacific islands for a number of years. Laboratory staff have also been involved in a range of other activities in the Pacific as either trainers or technical advisors contributing to the sustainable improvement of public health laboratory services in developing countries through establishing partnerships with these laboratories and established public health and reference laboratories'.

**KEY CONTACT:**

**Dr Muriel Dufour**

**E:** [muriel.dufour@esr.cri.nz](mailto:muriel.dufour@esr.cri.nz)



### WHO NATIONAL INFLUENZA CENTRE

ESR's National Influenza Centre (NIC) has been providing laboratory training and reference services for Pacific island countries for a number of years. In 2006, the SPC initiated a PPHSN laboratory-based influenza surveillance project for the six countries selected (Cook Islands, Fiji, Guam, Palau, Tonga, Wallis & Futuna). Dr. Sue Huang, the head of the WHO NIC at ESR, trained two senior medical laboratory scientists from Cook Islands and Tonga, for the immunofluorescence test. Since then, ESR's NIC has been providing reference services for influenza-related testing for Cook Islands and Tonga. During the 2009 pandemic, SPC and WHO approached ESR's NIC and made a formal arrangement for the NIC to provide international reference testing services during this period for Pacific island countries (Cook Islands, Tonga, Samoa, and Niue. In 2010, within the framework of the PPHSN, the SPC, together with ESR's NIC organised laboratory training for personnel from Polynesian countries (Cook Islands, Tonga, American Samoa, Western Samoa, Niue, and Tokelau). This training specifically addressed influenza testing issues and epidemiological aspects of testing with the aim of strengthening lab-based surveillance of influenza in countries and the role of the laboratory in influenza sentinel surveillance in general.

**KEY CONTACT:**

**Dr Sue Huang**

**E:** [sue.huang@esr.cri.nz](mailto:sue.huang@esr.cri.nz)



## ESR'S EXPERTISE, INFORMATION AND TOOLS

As a CRI and a resource for New Zealand government, ESR is well-placed to assist the Pacific region with scientific expertise, information and tools to strengthen policy, programmes and practice to achieve healthy, safe and resilient communities.



### **PUBLIC HEALTH, WATER AND FOOD SAFETY**

Surveillance and response at ESR is all about timely information for public health action. We focus on existing and emerging infectious disease outbreaks, and biological, chemical and radiological threats and events. ESR provides laboratory, surveillance and disease investigation and control services, advice, information management, policy and planning support, training and research to government agencies and the private sector.

ESR collates data and provides information at local and national levels to support compiling of national annual reports, rapid response and forward-planning, for example:

- New Zealand's notifiable disease and outbreak surveillance databases (<http://www.surv.esr.cri.nz>)
- New Zealand's national register and database of community drinking-water supply quality compliance (<http://www.drinkingwater.esr.cri.nz>)
- The New Zealand Public Health Observatory (<http://www.nzpho.org.nz>) developed by ESR as an initiative to improve access to public health surveillance data collected and reported by ESR. Internet and GIS technologies are used to make the data more widely available.

ESR has been instrumental in the progressive development of New Zealand's drinking-water quality management programme, including revisions of the drinking-water standards, annual national-level reporting on compliance with legislation and standards, maintenance of the national register of drinking-water suppliers, and the introduction and development of practical tools for public health-focussed risk assessment and management planning. Risk management planning is a fundamental requirement of compliance with drinking-water standards and health legislation, and access to government subsidy for drinking-water supply improvements. ESR's expertise in public health-focussed risk management of drinking-water supply has been widely applied in the Pacific.

ESR provides high-level advice to the New Zealand Government and the WHO on myriad risks to the food supply and has substantive expertise in the area of risk analysis, modelling and assessment, food contamination, foodborne diseases, chemical contaminants and dietary health.

### **RADIATION**

The National Centre for Radiation Science (NCRS) has expertise in environmental radioactivity measurement. It has been responsible for monitoring environmental radioactivity levels in New Zealand and throughout the South Pacific islands since 1960. NCRS has a long association with the South Pacific, having conducted monitoring operations over long periods. It is also part of global monitoring programmes which provide atmospheric radioactivity data daily from stations around the world. NRSC can therefore provide early warning of any approaching air masses contaminated with radioactivity, as might arise from nuclear reactor accidents, nuclear ship emergencies, nuclear-weapon detonations or terrorist activity. It is able to provide measurement services to determine levels of radioactive contamination in air, water and food from any of these sources, or accidents involving release of radioactive materials onshore. Incident and emergency response field teams can be deployed, and advice provided to Government on radiation safety and security.



## RESEARCH

ESR is at the forefront of research aimed at reducing vulnerability and improving resilience of communities. ESR leads the US Department of Health and Human Services 'Southern Hemisphere Influenza Vaccine Effectiveness Research and Surveillance' (SHIVERS) project that is looking at how the influenza virus and other respiratory pathogens spread through populations. In addition to providing an extended evidence base, the project will be used to inform public health and vaccination strategies around the world in an effort to protect the most vulnerable patients and better plan for and protect against flu epidemics and pandemics.

ESR led the development of a 'Health Analysis and Information for Action' (HAIFA) system. The system provides scientifically robust methods and tools to develop appropriate responses and adaptive strategies for increasing human health resilience to the infectious disease consequences of climate variation and change. It generates current and future risk profiles for a suite of infectious diseases at the local to national level based on an integrated assessment of predicted risk of infection and community vulnerability.

ESR has led an integrated groundwater research programme since 1993. A major new government-funded groundwater assimilative capacity research programme in partnership with Lincoln Ventures Limited began in 2011. It brings water quality management and land-use planning together by improving the scientific understanding of the linkage between land use, the subsurface environment and groundwater. A key outcome is the development of tools to enable regional councils to achieve groundwater quality targets.

ESR, in collaboration with other Crown Research Institutes, began a government-funded clean water productive land research programme in 2010. The research will enable rural industries and central and regional government to predict water quality contaminant loads (nutrients, sediment and faecal microbes) to surface water across space and time. ESR research will focus on understanding contaminant sources and pathways at the interface between land and water.

ESR is the lead organisation for the government-funded biowastes research programme, integrating all of New Zealand's biosolids (sewage sludge) research. The research will provide information and recommendations for regional land-use planning, national guidelines and policy directions. The Centre for Integrated Biowaste Research is working on an innovative programme "Up the Pipe Solutions" to help reduce and recycle the wastes we produce as a society.

ESR leads the MBIE-funded seven-year viral research programme concerning Seafood Safety in New Zealand to protect NZ's \$1.7b seafood industry. ESR's major contributions are in its norovirus and genomics expertise.



**INSTITUTE OF ENVIRONMENTAL  
SCIENCE AND RESEARCH LIMITED**

**Kenepuru Science Centre**

34 Kenepuru Drive, Kenepuru, Porirua 5022  
PO Box 50348, Porirua 5240  
New Zealand  
T: +64 4 914 0700 F: +64 4 914 0770

**Mt Albert Science Centre**

120 Mt Albert Road, Sandringham, Auckland 1025  
Private Bag 92021, Auckland 1142  
New Zealand  
T: +64 9 815 3670 F: +64 9 849 6046

**NCBID – Wallaceville**

66 Ward Street, Wallaceville, Upper Hutt 5018  
PO Box 40158, Upper Hutt 5140  
New Zealand  
T: +64 4 529 0600 F: +64 4 529 0601

**Christchurch Science Centre**

27 Creyke Road, Ilam, Christchurch 8041  
PO box 29181, Christchurch 8540  
New Zealand  
T: +64 3 351 6019 F: +64 3 351 0010

[www.esr.cri.nz](http://www.esr.cri.nz)

