NIWA
Taihoro Nukurangi

NIWA Annual Report 2017/18

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SCIENCE GUIDING OUR FUTURE

NIWA
Annual Report
2017/18

Climate Science 24

New Zealand's pre-eminent provider of atmospheric and climate science

Freshwater Science 30

Supporting the sustainable management of our freshwater resources

Ocean Science 36

Understanding, managing and maximising the benefits of our marine estate

NIWA
Taihoro Nukurangi

NIWA
Annual Report
2017/18

SCIENCE GUIDING OUR FUTURE

Climate,
Freshwater &
Ocean Science

SCIENCE GUIDING OUR FUTURE

At the end of summer 2018 the Southern Alps were brown and raw. The snow and ice that once covered this spectacular landscape were now small white pockets clinging to slopes and valleys.

Our scientists were expecting the worst when they took to the skies in March for the annual glacier survey. These flights over the Alps document how much ice is left in the mountains after the summer melt. This year, the 40th anniversary of the survey, the snowline was higher than ever, the ice driven back by New Zealand's hottest summer on record and a marine heatwave in the Tasman Sea.

Left
Retreating glaciers were a constant theme of the annual survey.
(Dave Allen)

Top
Scientists flew over the Southern Alps in early March to measure the snowline following New Zealand's hottest summer on record. This year marked the 40th anniversary of the annual survey that provides crucial climate change information.
(Dave Allen)

The survey provided further evidence of our changing climate, and is a stark reminder that NIWA's climate science expertise is fundamental to guide our adaptation to the environment we face.

The change in the mountains was mirrored by change across New Zealand in the past year – a new government prompting a shift in focus with an emphasis on building a low carbon economy and greater protection of the environment.

It comes with an expectation that NIWA will continue to provide high quality science to inform policy and planning decisions, while at the same time remaining innovative and agile enough to enable our staff to push the uptake of science into new arenas.

NIWA has again stepped up to that challenge and continues to provide leadership, expertise and technical capabilities as New Zealand's pre-eminent provider of climate, freshwater and ocean science.

In our 2017/18 Statement of Corporate Intent, we acknowledged that the need to respond to a changing climate posed significant challenges for our primary sector, infrastructure and coastal communities.

The extreme summer heat and two ex-tropical cyclones in quick succession in February helped elevate those challenges in the public consciousness, and emphasised that mitigating and adapting to climate change is ever more pressing.

NIWA recognises that these challenges also present opportunities to a country that is small enough to adapt quickly and renowned for its innovation and smart thinking.

Complicating the task, however, is global uncertainty about how proposed reductions in greenhouse gas emissions will play out. How does a council whose main settlements are coastal plan for sea-level rise that might range from 0.5m to 1.4m over the course of 100 years? How does it plan the scale of flood control mitigation required to accommodate projected increases in rainfall of between 5 and 20 per cent? How does a farmer know what crops will be viable as temperatures continue to increase?

That is an area in which NIWA expertise has been in particular demand, and our scientists have been working alongside local and central government to inform this transition.

NIWA led preparation of the Ministry for the Environment's Coastal Hazards and Climate Change Guidance, released in December 2017, which offers coastal adaptation guidance for local government. It updated the 2008 guidance and, for the first time, incorporated uncertainty into planning objectives.

We completed high-profile climate change reports for the Auckland and Wellington regions, just as we have done for other territorial authorities. Our ability to apply our knowledge in this way is in high demand.

Among our significant science achievements this year, two projects stand out. The first was the replacement of our supercomputing capability. The two new Cray XC50s are amongst the most powerful supercomputers in the world for scientific calculations. They, and their companion Cray CS400, are crucial to improving our ability to forecast the impacts of severe weather and to model climate change, river flow, ocean levels and wave patterns.

In February, NIWA's flagship research vessel *Tangaroa* left Wellington for a six-week voyage to Antarctica – its 12th such survey. It was a very successful collaborative voyage that called scientists from a range of disciplines and institutions to work together in often arduous conditions. *Tangaroa* is uniquely equipped for comprehensive atmospheric and ocean experiments, and the research the vessel supports has made a significant contribution towards realising the goals of the new Ross Sea Marine Protected Area. *Tangaroa* will be back in Antarctic waters again in 2019.

Meanwhile, our workload remains at an all-time high as we respond to the increasing demand for our climate, freshwater and ocean science services. That demand resulted in us adding 39 new science staff during the year, taking our total staff to 679.

Revenue at $151.4 million for the year was better than budget and materially better than the previous year. Earnings before interest, tax, depreciation and amortisation (EBITDA) was $23.7 million, and net profit after tax was $6.5 million – a particularly pleasing financial performance.

Science highlights

Climate, freshwater & ocean science

Overall, we achieved 37 of the 40 research and applied science Key Performance Indicators we set for the year. Good progress was made with the other three programmes, but full achievement was delayed mostly by circumstances beyond our control.

Climate science

Since March 2018 NIWA has been providing a nightly bespoke animated weather forecast to Māori Television for broadcasting on their evening news bulletin. The weather segment combines NIWA's cutting-edge forecasting technology with traditional mātauranga Māori, knowledge of wind, waves and lunar phases.

The forecast is tailored for a Māori audience and is helping promote NIWA's weather capabilities to a new audience, with the intention of developing commercial and technical relationships with Māori to help grow their primary sector businesses. It was developed by our Forecasting Services Team with support from the 13-strong Te Kūwaha, NIWA's National Centre of Māori Environmental Research, which has a special role working in collaboration with iwi and hapū.

The Forecasting Services Team has also developed a new type of predictive modelling that can be tailored for companies selling products or services that might be influenced by the weather – everything from transport movements to beer sales. By linking forecasting with other known factors, such as previous sales data, location, holiday times, sporting or social events, the model can more accurately predict sales volumes and quantify the variability.

Demand for NIWA's work in the Pacific Islands over the past year has also been substantial as we build capacity to help the island nations strengthen their resilience to natural disasters. We have installed more than 200 weather, climate and hydrology stations throughout the region, training local staff as we go to increase their capability and reduce their dependency.

The PARTneR (Pacific Risk Tool for Resilence) programme in Samoa and Vanuatu is teaching staff in government agencies to use RiskScape, a software programme developed by NIWA and GNS Science, which estimates impacts and losses from natural hazards. More than 100 people have now taken part in our training programme.

Freshwater science

Concerns about the quality of New Zealand's freshwater environment were abundantly articulated during last year's election campaign. NIWA's technical and scientific expertise in this area has been keenly sought after by policy and decision makers as we continue to make substantial contributions to setting standards and improving understanding.

The National Objectives Framework in the National Policy Statement for Freshwater Management is one example where our science has been applied in the setting of targets and limits for water quality and ecosystem health.

The National Environmental Monitoring Standards project is another. It aims to ensure consistency in the way environmental monitoring data is collected and handled throughout New Zealand. Our skill in this field – critical for supporting consistent water quality monitoring, reporting and management across New Zealand – will ensure a best practice supply of quality data. NIWA has also been providing the Ministry for the Environment with scientific evidence to enable better management of freshwater inputs in estuaries.

Overall, we achieved 37 of the 40 research and applied science programme Key Performance Indicators we set for the year.

Top
The new Cray XC50 supercomputer installed at NIWA's Wellington site this year.
(Dave Allen)

Middle
Māori TV's nightly weather forecast supplied by NIWA.
(Māori TV)

Bottom
Vanuatu Meteorology and Geohazards Department technicians work on the cabling during installation of a NIWA weather station to improve resilience in the country.
(Dave Allen)

One of our high profile projects in the past year was measuring the visual clarity of Te Waikoropupū Springs, near Takaka. The springs, along with Blue Lake in Nelson Lakes National Park, are a taonga and considered to have some of the clearest waters ever measured.

Divers are no longer allowed in the springs, but our scientists used a zip line to deploy their precision instruments, and they estimated that the visual clarity of the springs was about 76m, and at times close to that of pure water – an exceptional result which is broadly comparable to the water in Blue Lake. Our measurements are key to ensuring the springs' clarity remains a top conservation priority under the National Policy Statement for Freshwater Management.

Ocean science

In December 2017 our scientists on *Tangaroa* were carrying out research in the Kermadec Trench, and they sent the following email: "New ocean wire and multicorer have plucked a sample from the bottom of the trench, 9994m. Awesome!"

So awesome, in fact, that at a depth of nearly 10 kilometres it was the deepest ever sediment sample retrieved from the bottom of the ocean, and the whole process took six hours. The scientists also confirmed that the deepest ocean trenches can be hotspots of intensified biological activity, further adding to global understanding of our oceans.

In another first, our marine geologists completed additional research on the Kaikōura Canyon and determined that at least 850 million tonnes of sediment was dislodged from the canyon head in the 2016 Kaikōura earthquake, and that similar events are calculated to occur on average every 140 years. This was the first global example of the impact of canyon flushing on the seafloor.

This year also marked 10 years of NIWA research into the vulnerability of our marine ecosystems as the oceans respond to climate change. Greenlipped mussels, pāua and snapper have gone under our microscopes as we seek to learn more about how increasing ocean acidity is affecting these iconic species.

The project includes a 20-year record of pH measurements taken along a 65km line in the open ocean off Otago. This is the only time series of its kind in the Southern Hemisphere and has contributed to a far greater scientific understanding of how the ocean is changing.

Our Northland Marine Research Centre at Bream Bay, through Leigh Fisheries, continues to regularly supply kingfish to the Auckland market as part of our bid to prove the biological and financial sustainability of a land-based commercial kingfish aquaculture operation. Discussions are underway with regional and industry partners to take the next step – scaling up production to test the viability of a kingfish aquaculture industry for New Zealand.

Advances in the National Science Challenges

NIWA hosts two of New Zealand's National Science Challenges, *Deep South* and *Sustainable Seas*, and is a collaborating party in another four – *Our Land and Water, Resilience to Nature's Challenges, New Zealand's Biological Heritage*, and *Building Better Towns and Cities*.

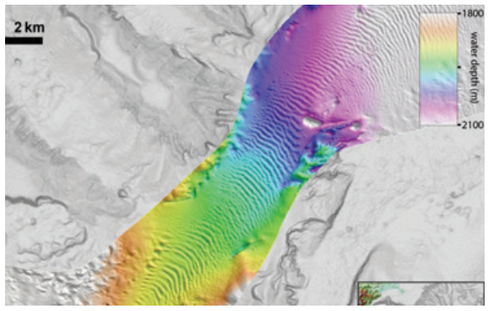
Deep South is focused on helping New Zealanders anticipate, adapt, manage risk and thrive in a changing climate.

A highlight this year was the Antarctic voyage on *Tangaroa*, which provided unique opportunities to take observations in the Southern Ocean and its overlying atmosphere. The data collected will improve the development of the New Zealand earth system model, which is central to the challenge's broad effort to refine and focus climate predictions for New Zealand.

NIWA researchers have also led or contributed to several *Deep South* Vision Mātauranga projects, enabling hapū to access and integrate climate information to improve community planning and decision making.

Sustainable Seas has the vision of healthy marine ecosystems providing value for every New Zealander.

There are 40 interdisciplinary projects under way, 14 of which are led by NIWA. In the past year the challenge



Top left, top right
Kingfish bred and reared at our aquaculture facility at Bream Bay – the Northland Marine Research Centre – are being regularly supplied to Auckland restaurants.
(Petra Pearce)

Bottom
The view from *Tangaroa*'s bridge when a nine metre swell from the northwest meets a six metre swell from the south in the notoriously rough Southern Ocean.
(Sarah Searson)

Bottom right
Kingfish at Bream Bay.
(Crispin Middleton)

Middle left
Post-earthquake morphology of the lower canyon gravel waves in the Kaikōura Canyon. Our research showed that sediment was flushed out of the canyon and more than 680km along the seabed.
(NIWA)

advanced scientific knowledge about New Zealand's marine environment and developed tools to support ecosystem-based management, a holistic approach to managing competing uses and demands on our marine resources so that marine ecosystems are healthy, and our blue economy is strong.

Working with partners

NIWA's well-recognised strength in climate, freshwater and ocean science has not constrained our collaboration with other scientists and institutions. Collaboration is a cornerstone of our achievements each year as we seek advances in national and international challenges and the best possible outcomes for all New Zealanders.

This year our expertise in marine geology was called on for two international expeditions aboard the US National Science Foundation's scientific drilling research vessel *JOIDES Resolution*.

Scientists on board studied the Hikurangi subduction zone – New Zealand's largest earthquake and tsunami hazard source – as part of the International Ocean Discovery Program. Involving 30 scientists from around the world, the first expedition was co-led by NIWA and the University of Auckland.

Ahead of the *JOIDES Resolution* voyages, our scientists on *Tangaroa* joined forces with GNS Science staff for the largest ever deployment of seafloor earthquake recording instruments.

Collaboration was the hallmark of our Antarctic voyage on *Tangaroa* in February, and it was also evident on the ice itself, where we played a key role in one of the largest scientific undertakings in Antarctica as part of the multi-disciplinary team exploring the ocean beneath the Ross Ice Shelf.

We are also playing a key role in an ambitious international project to produce a definitive map of the ocean floor by 2030. The project, called Seabed 2030, is a collaboration between Japan's Nippon Foundation and an international group of scientists. Four regional centres have been established to coordinate the project, and NIWA is leading the South and West Pacific Ocean – an area equivalent to one-quarter of the world's oceans.

Our close relationship with the US National Oceanic and Atmospheric Administration (NOAA) continued, and we worked together in September to upgrade a tsunami reporting station in the Pacific. This is part of a UNESCO group working to improve and sustain tsunami warning systems.

In June, Ballance Agri-Nutrients used Fieldays to launch *My Farm Forecaster,* an app offering farmers hyper-local, high-resolution weather forecasts. The app was developed in partnership with NIWA and has been described as a rural game changer.

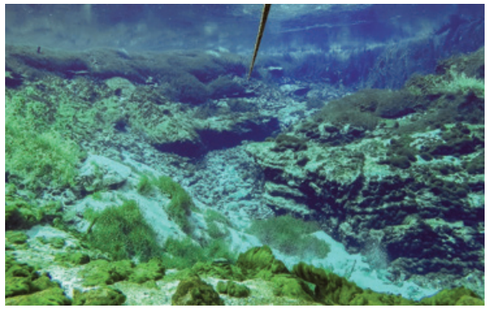
We are also working closely with the Ministry of Business, Innovation & Employment (MBIE), industry partners and iwi leading a new irrigation programme that will enable farmers to better manage their water usage. *Irrigation Insight* recognises the role farmers play in looking after the environment and brings together a diverse range of stakeholders to share irrigation knowledge and design solutions.

Collaboration is a cornerstone of our achievements each year as we seek advances in national and international challenges and the best possible outcomes for all New Zealanders.

Top
Principal Scientist and sea-level rise expert Dr Rob Bell with Climate Change Minister James Shaw at NIWA's Fieldays exhibit, which focused on helping farmers better prepare for the impacts of climate change.
(Stuart Mackay)

Middle
Te Waikoropupū Springs near Takaka are the largest freshwater springs in New Zealand and nationally and internationally valued for their remarkable colour and clarity which we measured at 76 metres.
(Mark Gall)

Bottom
JOIDES Resolution is a state-of-the-art floating earth science laboratory used by the International Ocean Discovery Program around the globe. It spent several months in New Zealand waters this year with a voyage co-led by NIWA researching the Hikurangi Subduction Margin, the source of our largest earthquake and tsunami hazard.
(National Science Foundation)



Growing the science constituency

NIWA is strongly committed to growing the understanding of the role and benefits of science and, in particular, encouraging New Zealand's future scientists by taking a leading role in supporting students of all ages.

We have long fostered interest in science among secondary school students through our sponsorship of seven main city science and technology fairs and eight regional fairs – connecting us every year with thousands of students, parents and teachers nationwide, and highlighting the role of science in informing debate and providing solutions.

Many of our staff act as judges at these events and we believe the benefits are mutual – the students gain an insight into science as a solution provider and the range of careers open to them, while our staff are consistently inspired by the creativity and passion shown in the entries.

We continued to develop our exciting and rewarding partnership with the Sir Peter Blake Trust, as Principal Science Partner, and our Blake Ambassador programme this year includes research voyages on *Tangaroa*, aquaculture at our Northland Marine Research Centre, the ozone hole over Antarctica and our native fish. Each year we sponsor up to six outstanding young New Zealanders who work alongside our researchers as part of the programme, and they go on to inspire and educate others about the role of science in society.

Alongside the other Crown Research Institutes, through Science New Zealand, we also support the annual Sir Paul Callaghan Eureka Awards, which challenge secondary school and tertiary students to deliver a presentation about how an application of science or technology will benefit New Zealand's economic, environmental and social wealth and wellbeing. The Eureka Awards include a NIWA scholarship, awarded to the student who delivers the best presentation related to climate, freshwater or ocean science.

Over the past year we have strengthened our partnership with the University of Waikato via the *Te Waiora Joint*

Institute for Freshwater Management. The institute's mission is to undertake applied research and increase capability across a range of disciplines relating to freshwater management to lift the quality of freshwater decision making for New Zealand and internationally.

At the end of 2017 a director and chair of lake and freshwater science were appointed, joining the existing chair of environmental economics. This year a deputy director focusing on iwi partnerships, and a new chair in river science joined the team. A proposed chair of mātauranga wai is being explored with the Waikato River Authority and regional iwi.

A strong initial focus in developing *Te Waiora* has been to foster wider partnerships with river and lake iwi in the rohe of Waikato University. Iwi engagement principles and priorities for water management have been agreed, and ways of promoting meaningful iwi involvement in the governance and operations of the institute are being explored.

This year NIWA staff supervised about 75 PhD and MSc or Hons students from universities around the country. In addition, we offered valuable work experience to more than 30 students from both New Zealand and overseas universities, and two students were appointed into paid summer internships this year, winning their positions over many highly competitive applicants.

A healthy and safe workforce

Our staff frequently work in exotic environments, and they are routinely put in potentially dangerous situations where they are exposed to extremes in weather, location and activity.

The health and safety of our employees is always our number one priority – both in the field and in our offices. This year the focus of our health and safety programme has been on reinforcing existing processes under our health and safety management system, *NIWAsafe*.

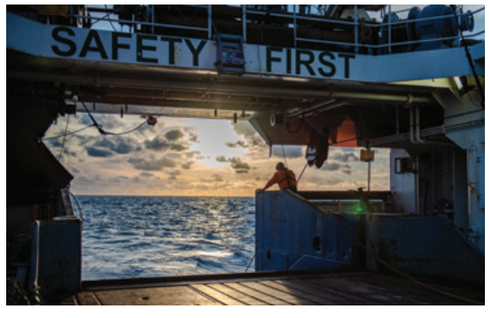
A suite of seasonal health and safety messages was rolled out across our sites, identifying key risk areas and safety actions, including such things as staying sun safe – using real time NIWA UV measurements to identify high risk periods for sun exposure – and safe driving tips for winter conditions. The campaign's aim was to help reduce the number of safety incidents and near-misses.

In another safety initiative, all employees are to be issued with 'grab and go' bags to assist in any unplanned event during worktime.

At our annual training for NIWA safety representatives the focus was on worker participation, especially when it comes to improving engagement in hazard management.

In November we launched on-line incident reporting using SharePoint functionality. This has resulted in an increase in reporting, improving the opportunity to learn from incidents. The SharePoint platform will be used to further digitise our health and safety system.

NIWA retained its ACC Tertiary Accreditation this year after a successful audit.



The health and safety of our employees is always our number one priority – both in the field and in our offices.

Top
Winners of the NIWA Waikato Science and Technology Fair.
(Tracey Burton)

Middle
Chief Executive John Morgan at the inaugural Science New Zealand awards ceremony at Parliament.
(Science New Zealand)

Top right
A weather balloon with radio sonde attached is ready for take-off at NIWA's atmospheric research station in Lauder.
(Dave Allen)

Bottom
Sunset aboard *Tangaroa*.
(Hamish McCormick)

An exciting future

In November 2017 NIWA, along with the other six Crown Research Institutes, marked its 25th anniversary. A highly successful joint CRI conference, expo and awards ceremony hosted by the Minister of Research, Science & Innovation, Hon Dr Megan Woods, at Parliament celebrated the contribution CRIs make to New Zealand and public understanding and appreciation of that work.

A year of change in New Zealand has been mirrored within NIWA. This year we updated our brand identity with a new logo that represents the integrated world we operate in. The global icon represents our three main science platforms – climate, freshwater and ocean science – surrounding a stylised New Zealand, with contemporary, flowing typography.

There was a significant change in our Board of Directors at the end of our financial year, with Chairman Sir Christopher Mace and board members Professor Keith Hunter and Jason Shoebridge all retiring. We welcomed Barry Harris, a company director with extensive governance and executive experience, as our new Chairman, and Dr Tracey Batten and Mary-Anne Macleod as new board appointees.

This year we created a new executive role of *General Manager – Technology and Innovation* to increase our focus on leveraging the extensive and sophisticated technology we employ, and the innovation we constantly seek, as we adopt the exciting developments in digital technology. Dr Barry Biggs, previously *General Manager – Operations,* was appointed to this new position, and we welcomed Dr Helen Neil to the Executive Team as the new *General Manager – Operations.*

We have made good progress in our planning for a multi-site building redevelopment programme to better equip NIWA for the future. This will see our major sites in Wellington, Christchurch and Hamilton upgraded with contemporary facilities with the flexibility to meet the future needs of science and a new generation of researchers.

We are making this investment with confidence – both in the organisation's ability to resource future opportunities based on sound fiscal management, and in our people who we know have the experience, skills and vision to build on our long track record of delivering excellent climate, freshwater and ocean science with impact and relevance.

Finally, we would like to thank the Board and the Executive Team for their support and contribution in leading NIWA throughout the year and acknowledge the leadership of Sir Christopher Mace throughout his nine-year tenure as Chairman.

Barry Harris
Chairman

John Morgan
Chief Executive

We have made good progress in our planning for a multi-site building redevelopment programme to better equip NIWA for the future.

Top
NIWA's research vessel *Tangaroa* against the Auckland city night skyline shortly after completing a spell in dry dock for its regular maintenance.
(Stuart Mackay)

Top right
Chief Executive John Morgan and Chairman Barry Harris.
(Stuart Mackay)

Bottom
While in dry dock *Tangaroa* was updated with NIWA's new logo and branding.
(Stuart Mackay)

OVERVIEW OF GROUP FINANCIAL PERFORMANCE

For the year ended 30 June 2018

NIWA Group Financial Summary

in thousands of New Zealand dollars	2018	2017	2016	2015	2014
Revenue and other gains	151,416	142,618	130,309	126,190	123,397
– Research	91,516	81,417	68,896	64,075	65,176
– Applied science	59,899	61,200	61,412	62,115	58,221
– Other income	1	1	1	–	–
Profit before income tax	9,074	5,950	5,492	8,005	7,324
Profit for the period	6,472	4,250	4,011	5,755	5,278
Capital expenditure	33,573	13,053	12,592	15,652	10,852
Adjusted return on average equity (%)	6.9	4.8	4.7	7.0	6.7
Return on average equity (%)	5.5	3.8	3.7	5.5	5.2

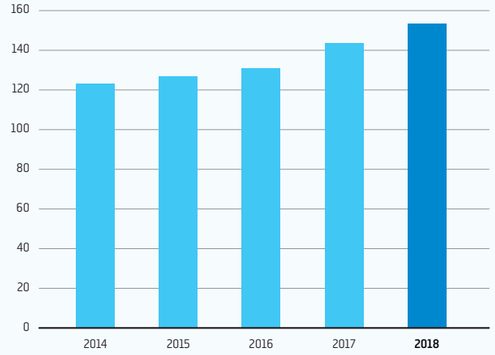
The 'adjusted return on average equity' uses a valuation basis comparable to that used by other Crown Research Institutes. This valuation basis arose from the transition to New Zealand Equivalents to International Financial Reporting Standards in 2006/07 and reverses the effect of the revaluation of certain land and buildings.

Group actual performance versus Statement of Corporate Intent (SCI)

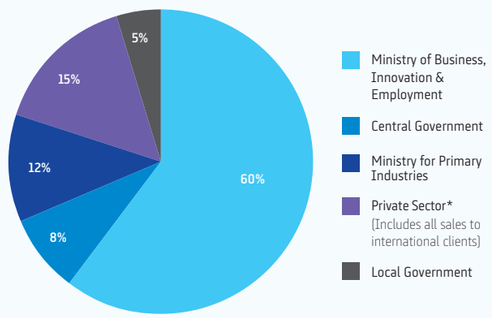
in thousands of New Zealand dollars	2018 Actual	2018 SCI	2017 Actual
Revenue and other gains	151,416	148,670	142,618
Operating expenses, depreciation, and amortisation	143,232	141,945	137,539
Profit before income tax	9,074	8,072	5,950
Profit for the period	6,472	5,809	4,250
Average total assets	160,388	159,393	151,542
Average shareholders' funds	116,826	116,218	111,454
Profitability			
Operating profit margin (%) (EBITDAF/revenue)	15.6	15.8	14.6
Adjusted return on average equity after tax (%) (net surplus/adjusted average equity)	6.9	6.2	4.8
Return on average equity after tax (%) (net surplus/average equity)	5.5	5.0	3.8
Return on assets (%) (EBIT/average total assets)	5.1	4.2	3.4
Profit volatility (%) (non-adjusted ROE)	7.2	6.8	6.1
Forecasting risk (%)	1.2	1.1	1.1
Liquidity and efficiency			
Current ratio	1.3	1.4	1.7
Quick ratio	1.9	2.0	2.8
Financial leverage			
Debt to average equity (%)	–	–	–
Gearing (%)	–	–	–
Proprietorship (%) (average shareholders' funds/total assets)	71	73	71

With research funding uncertainties resolved, 2017/18 continued the prior year's focus on building revenue and capability and maintaining a strong platform for future growth.

Total revenue
($ in millions)



Revenue by source



Financial Summary

Revenue

The more secure platform for NIWA research programmes driven by recent increases in Strategic Funding from MBIE underpinned growth in other research revenue streams this year. NIWA achieved revenue of $151.4 million in 2017/18, an increase of $8.8 million compared with the previous year and $2.7 million higher than the budget for the year.

As expected, the level of MBIE contestable research funding derived by NIWA during the year increased over the prior year by $3.1 million, reversing the trend of previous years. In addition, the National Science Challenges, two of which are hosted by NIWA, picked up further momentum, resulting in a revenue increase of $5.6 million compared with the previous year – although $2.1 million of this was accounted for by revenue passed on to collaborators within those Challenges, leaving a year-on-year increase of $3.5 million to support NIWA's research activities.

Year-on-year, the share of NIWA's revenue arising from transactions with its key central government clients – the Ministry of Business, Innovation & Employment and the Ministry for Primary Industries – rose by 3% to 72%. This was mainly driven by growth in revenue associated with the National Science Challenges and with Endeavour funding.

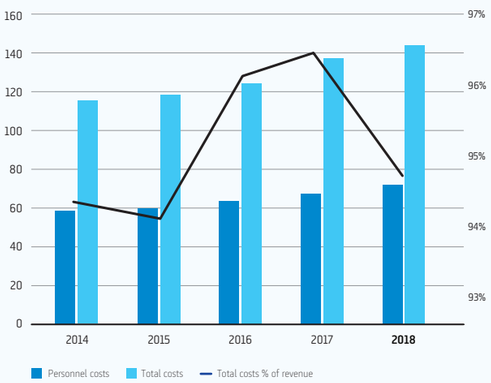
While a significant focus for the year was on delivering the work associated with growing levels of research revenue, NIWA is confident that over time this growth will be at least matched by sustainable increases in commercial revenue.

Expenditure

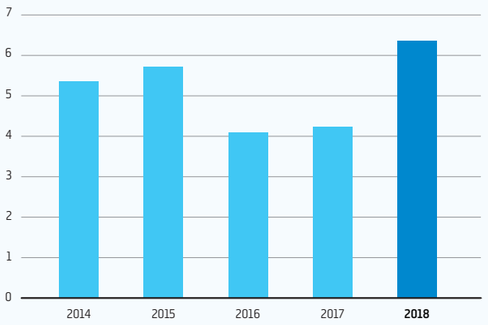
Operating expenses (including depreciation and amortisation) increased by $5.7 million compared with the previous year. Higher personnel costs accounted for $4.3 million of the increase as NIWA continued to build the capability needed to support sustained higher levels of science activity. The balance of the increase was accounted for by higher direct costs associated with the increased revenue.

Compared with the budget for the year, total costs were up by $1.3 million, an increase which was more than accounted for by direct project costs, driven by above-budget revenue. This higher than budget level of direct costs was offset by lower depreciation, which was related to the timing of the commissioning of NIWA's new High Performance Computing Facility.

Expenditure
($ in millions)



Net profit after tax
($ in millions)

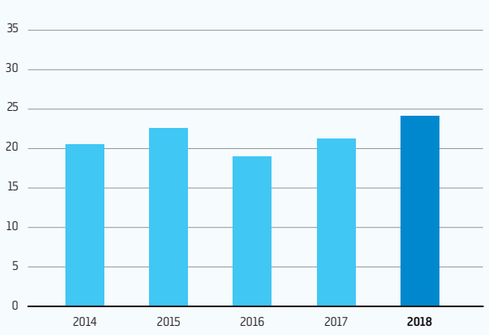


Profitability

Revenue growth outpaced growth in expenses, driving a profit before tax of $9.07 million and after tax of $6.47 million. This represented an improvement on the budget projection of approximately $8.07 million before tax and $5.81 million after tax. Compared with the previous year, NIWA achieved increases in profitability by $3.1 million and $2.2 million respectively.

NIWA also closely monitors its Earnings before Interest, Tax, Depreciation and Amortisation (EBITDA), because this measure assists in understanding NIWA's capacity to fund future investments and carry debt. Performance against this measure increased by $2.8 million compared with the previous year, to $23.7 million. This bodes well for NIWA's ability to finance its planned investments in upgrading its major facilities over the coming several years.

EBITDA
($ in millions)



NIWA's fundamental financial performance metric is adjusted return on equity, which enables comparison between CRIs on an equivalent basis. NIWA delivered an adjusted ROE of 6.9% this year, up from 4.8% last year and better than the budget objective of 6.2%.

Capital management and cash

Cash flows

The following table summarises NIWA's cash flows this year and last year:

($ in millions)	2018	2017	Change
Net cash flows from operating activities	22.694	24.956	(2.262)
Net cash flows from investing activities	(13.296)	(37.853)	24.557
Net cash flows from financing activities	0.0	0.0	0.0
Net increase/ (decrease) in cash	**9.398**	**(12.897)**	**22.295**

The above presentation is consistent with New Zealand Equivalents to International Financial Reporting Standards and therefore treats cash flows relating to short-term deposits with maturities greater than three months as investing activities. In order to provide more useful and relevant information concerning NIWA's cash flows, the table below restates the summary of cash flows, treating all short-term investments as equivalent to cash:

($ in millions)	2018	2017	Change
Net cash flows from operating activities	22.694	24.956	(2.262)
Net cash flows from investing activities	(33.296)	(12.853)	(20.443)
Net cash flows from financing activities	0.0	0.0	0.0
Net increase/(decrease) in cash including other term deposits	**(10.602)**	**12.103**	**(22.705)**

Net cash flows from operating activities

Net cash inflows from operating activities decreased by $2.3 million to $22.7 million in 2018. This year-on-year change was more than accounted for by differences in the timing of receipts related to National Science Challenge activity relative to the work being carried out.

Net cash flows from investing activities

Net cash outflows from investing activities (excluding the impact of cash flows associated with term deposits with maturities in excess of three months) increased by $20.4 million to $33.3 million. This year-on-year variance was due to the planned purchase of a replacement High-Performance Computing Facility.

Net cash flows from financing activities

Net cash outflows from financing activities remained at zero due to NIWA paying no dividend during the year. This was signalled in the previous year's Statement of Corporate Intent, and reflects upcoming essential and material investments designed to ensure that its science facilities remain fit for purpose for the coming decades.

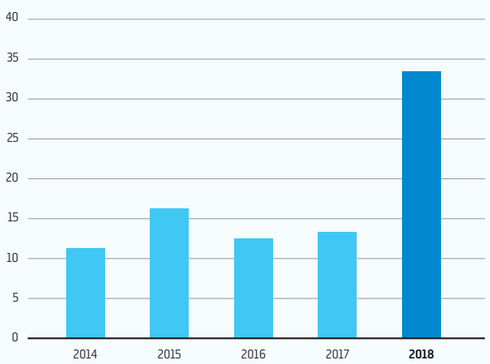
Capital spending

The following table summarises NIWA's capital expenditure this year and last year:

($ in millions)	2018	2017	Change
Land, buildings & improvements	4.523	1.175	3.348
Equipment	8.342	6.423	1.919
ICT equipment	18.593	1.904	16.689
Vessel equipment	0.801	0.255	546
Other	1.314	3.296	(1.982)
Total capital spending	**33.573**	**13.053**	**20.520**

Total capital expenditure was $33.6 million during the year, up from $13.1 million during the prior year.

Capital Expenditure
($ in millions)



Capital structure and liquidity

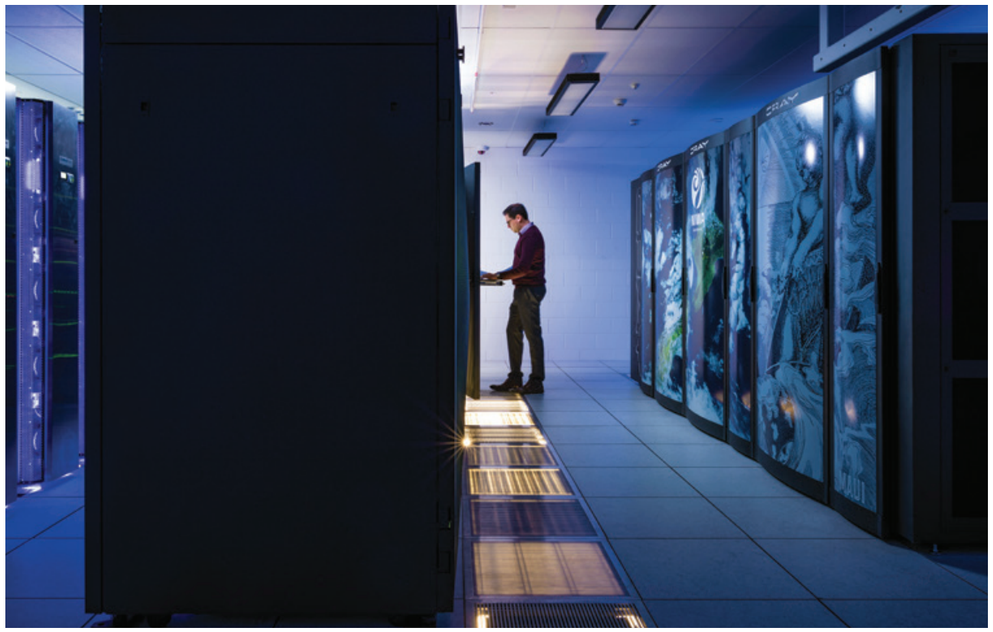
Shareholders' equity at 30 June 2018 was $120.1 million (2017: $113.6 million), which was $0.9 million higher than the level forecast in the SCI budget. Total assets at year end were $164.8 million (2017: $156.0 million). As at 30 June 2018, the Company's net debt balance was zero, equal to that at the prior year end.

NIWA's liquidity is mainly provided by operating cash flows. In addition, NIWA has access to financing facilities of $10.5 million provided by its bank, although this facility was not required to be called upon during the year.

Dividends

As foreshadowed in the Statement of Corporate Intent, the Directors of NIWA have once again decided not to declare a dividend in respect of the 2018 year. This is in light of a series of significant capital investments which will be required to maintain and build the Company's capability and financial sustainability for the future. These investments include renovating or replacing the physical infrastructure and facilities at three of the main sites, and continued development at the Northland Marine Research Centre at Bream Bay.

NIWA'S MOST SIGNIFICANT INVESTMENTS



High Performance Computing Facility upgrade

$17.8M

A new supercomputer, a Cray XC50 – one of the most powerful in the world for scientific calculations – was installed at NIWA's Wellington site this year. It, and its companion Cray CS400, alongside the rest of the upgraded national high performance computing facility, will provide services enabling scientists to conduct leading-edge research on the environment and climate simulation, as well as in other scientific disciplines.

Total capital expenditure this year was $33.6 million, up from $13.1 million in the previous year.

Top
The new Cray XC50 supercomputer.
(Dave Allen)

Top far right
Benthic lander.
(Scott Nodder)

Top left
Rotorua office.
(Deepak Chauhan)

Bottom right
Ikatere.
(Hamish McCormick)

Bottom left
Spectrometer.
(John Robinson)

Rotorua facility

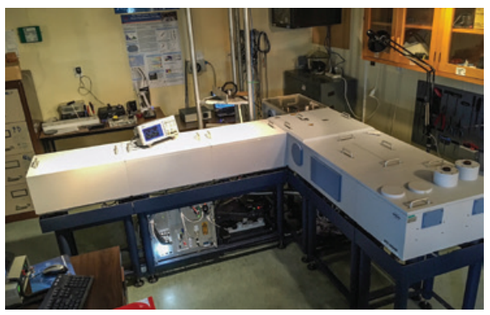
$1,000,000

A new office, workshop and laboratory facility has been built on Scion's Rotorua campus, further improving NIWA's ability to efficiently and effectively service customers in the central North Island.

Benthic lander instrumentation

$500,000

Benthic landers carry a payload of scientific instruments to an inhospitable undersea environment to help us better understand the processes operating there. This investment opens up new research and commercial opportunities for NIWA.



Bruker 125HR spectrometer

$480,000

By measuring total-column greenhouse gases to very high precision, Lauder's new spectrometer contributes valuable data on atmospheric processes. Space agencies in the US, Japan and Europe also use these ground-based measurements to validate their satellites.

Dual head multibeam echosounder

$450,000

High resolution marine multibeam systems allow us to acoustically penetrate the water column to map the seafloor and obtain information about benthic habitats. NIWA's new dual head EM2040 multibeam can be used across our marine platform.

NIWA IN A NUTSHELL

Core purpose

- Improving management of aquatic resources
- Adapting to our climate
- Increasing resilience to weather hazards
- Improving aquatic biosecurity
- Increasing understanding of Antarctica and the Southern Ocean

Science strategies

Climate

- Increasing understanding of the changing climate to improve adaptation to its impacts
- Increasing global understanding of the atmosphere
- Validating greenhouse gas emissions to better inform mitigation
- Improving forecasts to reduce the impact of weather and climate-related hazards
- Tailoring forecasts to weather-dependent sectors

Freshwater

- Improving understanding of freshwater quality and quantity
- Maximising the sustainable use of freshwater
- Developing ways to improve freshwater ecosystems
- Identifying threats from exotic species and developing tools to reduce them
- Improving national flood forecasting

Oceans

- Increasing understanding of the marine environment to improve management
- Maximising the sustainable use of marine resources
- Identifying threats from exotic species and developing tools to reduce them
- Maintaining the national deepwater research vessel capability
- Developing high-value finfish aquaculture species to grow the industry

Top left
Sunset off Kapiti Island.
(Dave Allen)

Top right
Juvenile kingfish at Bream Bay.
(Alvin Setiawan)

Bottom left
Milford Track.
(Ben Woodward)

Bottom right
Servicing a snow and ice station, South Island.
(Evan Baddock)

Technology, Innovation & Data Services

- Developing innovative ways to collect, assure and curate data
- Developing and providing enhanced data analytic tools
- Developing value-added, data-based products and services
- Effectively delivering environmental data and information
- Maintaining the national high performance computing facility

Enabling strategies

- **Safety**
  Safety first in everything we do
- **Science excellence**
  Globally respected, objective and trusted
- **Facilities and assets**
  State-of-the-art facilities, infrastructure and systems
- **Māori engagement**
  Respected, value-adding collaborator and commercial partner of Māori enterprises
- **Agility**
  Adaptable, responsive, opportunistic and embracing change
- **IT**
  State-of-the-art infrastructure and tools to deliver efficient and value-added services
- **People and leadership**
  Best scientists, technicians and support staff – the 'employer of choice'
- **Customer focus**
  Keep promises, communicate well, deliver on time, within budget and to specification
- **Productivity**
  Most cost-effective and efficient with resources, time and service delivery
- **Communication**
  Most respected and trusted brand, with innovative messaging tailored to audiences

NIWA'S SCIENCE

CLIMATE SCIENCE

Atmosphere
Weather
Natural Hazards

(2) (3) (4) (6)

FRESHWATER SCIENCE

Water Quality
Hydrology
Estuaries
Biodiversity & Biosecurity

(1) (2) (4) (5)

OCEAN SCIENCE

Oceanography
Fisheries
Aquaculture
Vessels
Biodiversity & Biosecurity

(1) (5) (6)

NIWA's three science platforms – Climate, Freshwater & Ocean Science – align with the Strategic Science Investment Fund Platforms we are contracted by MBIE to deliver and the Statement of Core Purpose Outcomes.

(1)

Increase economic growth through the sustainable management and use of aquatic resources.

(2)

Grow renewable energy production through developing a greater understanding of renewable aquatic and atmospheric energy resources.

(3)

Increase resilience of New Zealand and South-West Pacific islands to tsunami and weather and climate hazards, including drought, floods and sea-level change.

(4)

Enable New Zealand to adapt to the impacts and exploit the opportunities of climate variability and change and mitigate changes in atmospheric composition from greenhouse gases and air pollutants.

(5)

Enhance the stewardship of New Zealand's freshwater and marine ecosystems and biodiversity.

(6)

Increase understanding of the Antarctic and Southern Ocean climate, cryosphere, oceans and ecosystems and their longer-term impact on New Zealand.

New Brighton.
(Chris Woods)

CLIMATE SCIENCE

New Zealand's pre-eminent provider of atmospheric and climate science

Climate change and variability

High-precision weather forecasting

Weather-related hazard forecasting

Adaptation and mitigation

230
Science staff
New Zealand's largest team of climate scientists

$42M
Annual investment
in weather and climate research

7500
Climate stations
The National Climate Database with information from 7500 climate stations covering New Zealand, South-West Pacific and Antarctica

$18M
Supercomputer
enabling precise, highly localised forecasts

CLIMATE SCIENCE

New Zealand's temperature trend

NIWA's 'seven-station' temperature series shows that New Zealand's annual average temperature has warmed by about one degree Celsius since the beginning of the last century.

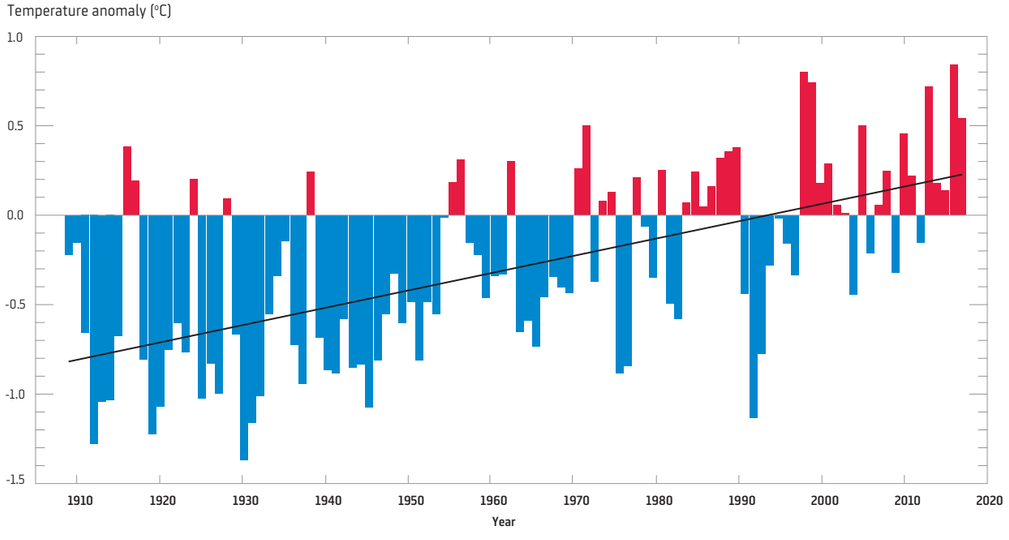
These seven climate stations – Auckland, Masterton, Wellington, Nelson, Hokitika, Lincoln and Dunedin – are geographically representative of New Zealand.

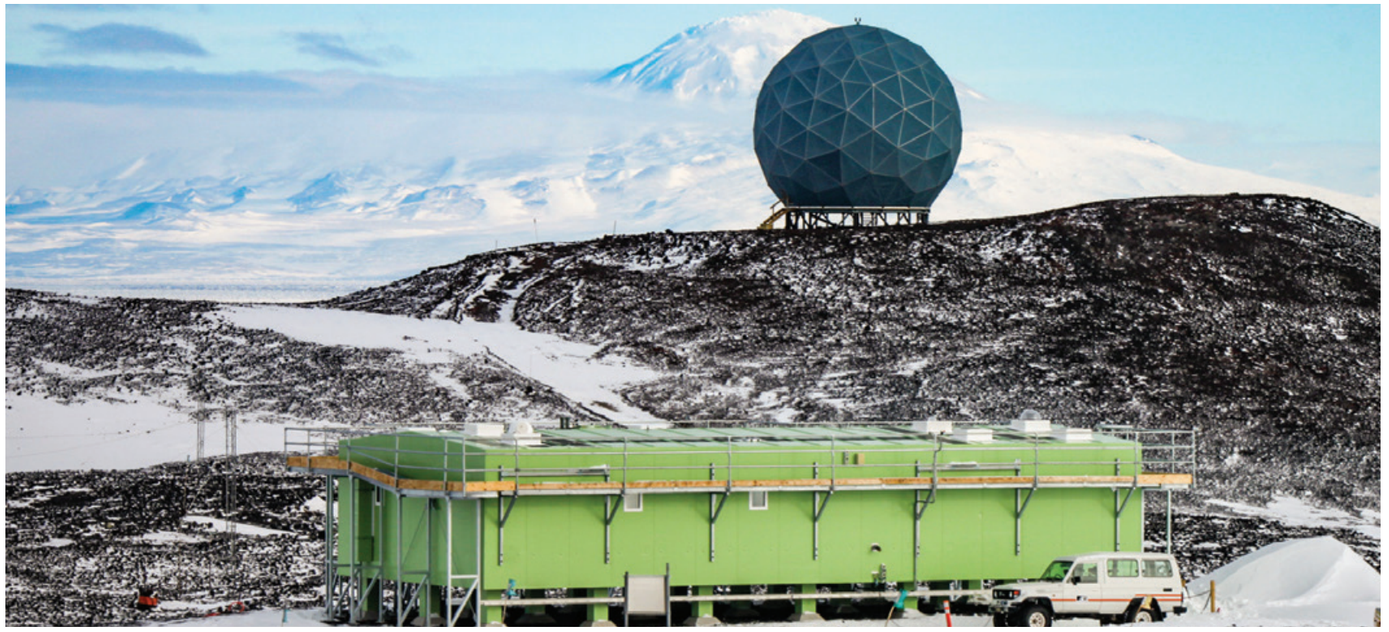
The observed warming trend is consistent with increasing global concentrations of greenhouse gases in the atmosphere, and the trend for New Zealand shows greatest warming in the north and least warming in the southeast. Using historical context, NIWA scientists now know that our winters are getting shorter and minimum temperatures are increasing faster than maximums.

Tracking these temperatures tells a story: how climate variations affect a range of economic activities in New Zealand, especially primary industries such as agriculture and horticulture, which are particularly sensitive to environmental changes. NIWA scientists also contribute to understanding the impacts of these rising temperatures on natural phenomena such as the mass of glaciers in the Southern Alps, snowlines and frost frequency.

This invaluable research means we are better able to evaluate the performance of complex computer models in simulating New Zealand's climate, and assess projected changes under a range of future scenarios.

New Zealand seven-station temperature series





The proof is in the atmosphere

NIWA's atmospheric research stations in Lauder (Central Otago) and Arrival Heights (Antarctica) provide crucial, long-term atmospheric measurements used by scientists worldwide to better understand the Earth's atmosphere.

Since 1961, Lauder has been the source of atmospheric measurements that are critical for climate science and satellite calibration and validation. Equally, Lauder's sister-site at Arrival Heights is maintained and operated by NIWA to provide understanding of atmospheric composition in the polar environment.

Global atmospheric datasets are biased towards the Northern Hemisphere because of the sparse observational network in the Southern Hemisphere. Lauder and Arrival Heights are uniquely positioned to contribute a wealth of important data in this otherwise vastly under-represented part of the world, and measurements from the two sites play a vital role in the ground-based validation of satellite data.

For instance, the performance of NASA's Stratospheric Aerosol and Gas Experiment III (SAGE III) instrument onboard the International Space Station is routinely evaluated using Lauder ozone sonde and remote sensing measurements. In collaboration with NASA and NOAA, Lauder launches weather balloons to coincide with SAGE III occultation events. These events occur when the instrument uses sunlight or moonlight to illuminate the atmosphere and measure vertical profiles of aerosols and trace gases, which can then be validated against Lauder's ground-based measurements.

NIWA atmospheric measurements are critical to providing New Zealand and the international research community with the knowledge needed to better understand and address climate change.

Left
Arrival Heights atmospheric research station, Antarctica.
(Fiona Anderson)

Right
Lasers at Lauder.
(Dave Allen)

Enhanced weather forecast accuracy

NIWA provides more accurate knowledge of the current weather conditions using a model which describes exactly how the atmosphere evolves.

The model is based on one from the UK Met Office, which is one of the most precise forecasting systems in the world because of its accurate representation of the atmosphere at a wide range of spatial and temporal scales, and is used by many leading agencies globally for weather and climate research.

NIWA collects a large set of observations that 'tune' the model at real-time to produce the best results. This means that NIWA's forecasts are continually compared to actual weather conditions and future forecasts are adjusted accordingly.

NIWA's high-performance computing facility allows our weather forecasting systems to run at a 1.5km resolution over the entire country – the most precise of any operational model in New Zealand.

Valleys, hills, water bodies and other landscapes that most models cannot see contribute significantly to local weather. Including such landscapes in our forecasts allows predictions for arbitrary locations to be more accurate, providing highly specific forecasts – for example, on-farm rainfall, maximum wind gust for port operations, or relative humidity for managing the spread of plant diseases.

Shaping a more resilient future

Floods are New Zealand's most frequent and damaging natural hazard, but communities will soon be able to better plan their flood response. NIWA's national river flow forecasting can provide hourly forecasts for two days ahead, for more than 60,000 rivers and streams across New Zealand.

Working with NIWA scientists, three regional councils have used RiskScape, a free software programme which estimates impacts from natural hazards, to inform asset management plans and reduce future impacts from floods and tsunamis.

Strong winds and tropical cyclones are also a focus at NIWA. Our scientists contribute to international efforts to improve weather forecast models, focusing on high resolution forecasting at the kilometre scale to better resolve the wind field associated with severe events like tropical cyclones.

Storm-tide and sea-level rise are other threats to our coastal communities. Using RiskScape, we have produced maps that identify at-risk populations and assets at national to district levels. NIWA also provided sea-level projections for a recent report published by the Ministry for the Environment, and councils can now identify how population and asset exposure to storm-tide hazards and sea-level rise may evolve in the future.

NIWA's high-performance computing facility allows our weather forecasting systems to run at a 1.5km resolution over the entire country – the most precise of any operational model in New Zealand.

Top left
Clevedon River in flood.
(Skyview Photography)

Top right
Storm damage at Pukerua Bay.
(Dave Allen)

Middle
NIWA's weather forecasting services team.
(Stuart Mackay)

Bottom
Climate scientist Nava Fedaeff in the NIWA media studio.
(Stuart Mackay)

Lake Wakatipu.
(Ayushi Kachhara)

FRESHWATER SCIENCE

Supporting the sustainable management of our freshwater resources

- Freshwater quality and quantity
- Sustainable use
- Biodiversity and biosecurity
- Flood forecasting

240
Science staff
New Zealand's largest team of freshwater scientists

$40M
Annual investment
increasing knowledge of water quantity and quality

66,000
A National Flood Forecasting Service
providing river flow forecasts for 66,000 catchments nationwide

Hydrological Network
A nationwide network of water and soil moisture monitoring stations

FRESHWATER

FRESHWATER SCIENCE

How much water is available?

New Zealanders are increasingly demanding better information on how much water is in our rivers and groundwater aquifers, how that has changed over time, and how it might change in the future.

NIWA is leading the National Hydrological Project, bringing together the nation's scientific providers and regional councils. The project will help to develop the New Zealand Water Model, a sophisticated computer model framework that will enable users to accurately predict how much freshwater is available, where it has come from, and how quickly it moves through catchments.

The project will not only greatly enhance the ability of the New Zealand Water Model to calculate how land use, climate and other environmental changes will affect the flows available for aquatic ecosystems, but it will also predict how much water is available for use by New Zealand communities and businesses.

NIWA science will both strengthen the model's river-flow applications, enabling communities to better prepare for floods and droughts, and provide essential information to councils to implement the National Policy Statement for Freshwater Management.

Through building a better understanding and providing fit-for-purpose tools and models, NIWA's freshwater research is crucial in informing the sustainable use of New Zealand's precious water resources.

Testing the quality of our water

Freshwater, both in its quality and quantity, is now the country's number one environmental issue. Public concerns are being translated into demand by authorities for new and improved methods for measuring water quality.

NIWA has created the country's biggest capability platform for freshwater science, employing more than 200 staff with expertise in the area. Measuring water quality is notoriously complex, but NIWA scientists are decoding the practical and scientific challenges of continuous water quality monitoring.

The NIWA freshwater team has a pilot scheme underway in Southland to monitor water quality continuously. Every five minutes, sensors in the Mataura River measure different aspects of the water, such as dissolved oxygen, nitrates, temperature, salinity and turbidity.

The measurements are stored in a logging device and sent by cellphone or satellite phone back to the NIWA office every hour. By monitoring continuously, the sensors measure flood events or pollutant discharge into the river. These important events could be missed by periodical monitoring. Continuous monitoring enables calculation of river health and ecosystem services metrics, such as metabolism and nitrate attenuation, in relation to monitored environmental drivers.

NIWA scientists are dedicated to ensuring that New Zealand has the best data and tools available to safeguard the quality of its most valuable resource.

How much water is in our rivers and groundwater aquifers, how that has changed over time, and how it might change in the future.

Top
Godley River, Canterbury.
(Dave Allen)

Top right
Spey River, Fiordland.
(Dave Allen)

Middle
Lake Pukaki and the Ben Ohau Range in autumn.
(Gregor Macara)

Bottom left
Scientist Murray Hicks at work in the Waimakariri River.
(Dave Allen)

Estuarine expertise

New Zealand has more than 300 estuaries – ranging from small, shallow lagoons to major coastal features such as the Firth of Thames and Kaipara Harbour.

They form some of our most productive ecosystems, supporting species ranging from invertebrates and mangroves to rare birds, such as godwits, or valuable commercial fish like snapper and gurnard.

But our estuaries are under serious threat. Sediment loads washing down rivers smother nutrient cycles, nearby urban landscapes leach toxic heavy metals into the catchment and rising sea levels are reshaping estuarine dynamics.

NIWA has a multi-disciplinary estuary team of more than 30 researchers focused on tracking these threats and modelling new methods of protecting and nurturing estuaries.

Hydrologists and soil scientists use biotracers and river catchment data to identify sediment sources and predict the impact of sediment and farm nutrient run-off on water quality and estuary ecosystems.

Chemical experts work with urban design specialists to develop new ways to avoid heavy metal run-off from urban roads and roofing iron and develop mitigation plans for predicted toxic hotspots.

Marine ecologists are mapping the impact of rising sea levels on mangrove forests and highlighting the value of estuarine habitats for carbon and nutrient storage and cycling – all to help ensure the protection of these valuable ecosystems.

Stopping the spread of aquatic invaders

Introduced weed and fish species can destroy the natural state of New Zealand's precious rivers, streams and lakes. NIWA science supports the protection of the country's freshwaters and estuaries from the impacts of invasive non-native species.

NIWA is at the forefront of nationwide research minimising the impacts of already present invasive species and reducing the risk of new alien species crossing the border to establish in our waters. Biosecurity research ranges from identifying invasive marine species to managing aquatic weeds.

NIWA is also home to one of the nation's largest diatom collections, which now comprises more than 3,000 samples from freshwater sources across New Zealand. Diatoms are microorganisms found in waterways which have silica cell walls that can be used to identify species long after the cells have rotted.

This invaluable collection is currently accessible in a computerised database, which has now been used to find out more about the distribution of *Lindavia intermedia*, the diatom that causes damaging lake snow. Lake snow is a nuisance slime that can block water intakes and stifle recreational fishing activities for businesses and communities.

Discoveries like this demonstrate the value of NIWA maintaining organised and accurate archived biological collections for understanding our freshwater environments now, and in the future.

Top
Investigating ecosystem health at Raglan estuary.
(Carolyn Lundquist)

Middle
Surveying macrophytes in Lake Okataina.
(Tracey Burton)

Bottom left
Mangroves.
(Jason Hosking)

Bottom right
Biosecurity survey of Lake Sylvan.
(Tracey Burton)

Macrocystis pyrifera at Mahanga Bay, Wellington.
(NIWA)

OCEAN SCIENCE

Understanding, managing and maximising the benefits of our marine estate

- New Zealand's Marine Estate
- Sustainable use of marine resources
- Biodiversity and biosecurity
- High-value finfish aquaculture

260

Science staff

New Zealand's largest team of ocean scientists

$67M

Annual investment

in coast and ocean, fisheries and aquaculture science

Northland Marine Research Centre

New Zealand's leading facility for finfish aquaculture

State-of-the-art Research Vessels

OCEAN SCIENCE

What lies beneath?

NIWA is a world leader in oceanography, using sophisticated equipment to understand more about ocean dynamics and marine environments and reveal the changing shape of the seabed in fine relief.

New Zealand is an outstanding laboratory for oceanographic research, attracting significant interest and investment from science organisations national and internationally. NIWA is New Zealand's largest marine science organisation, with 260 staff researching the coastal and oceanic environment and a world-class fleet of state-of-the-art research vessels. With New Zealand being exposed to a variety of hazards associated with undersea geological activity, NIWA and our collaborators provide world-class research and expert advice on submarine earthquakes, volcanism, undersea landslides and tsunamis. The work has significant public benefit in terms of better understanding and being prepared for natural hazards.

Expert contributions this year included a paper in the prestigious international scientific journal *Science Advances* on canyon flushing, and an investigation of earthquake and tsunami risk off the North Island east coast.

NIWA also led the most complex and comprehensive underwater coastal survey of the seafloor undertaken in New Zealand. The survey of Queen Charlotte Sound/Tōtaranui and Tory Channel/Kura te Au, using multibeam echosounder technology and multiple vessels, resulted in the most detailed picture of the physical and biological features of any region in New Zealand to help guide the Marlborough District Council's marine management decisions.

NIWA is a major provider in the international Argo programme – a global initiative of float deployment throughout the world's oceans with the aim of providing a comprehensive picture of the oceans' role in global climate, weather and climate-prediction services. *Kaharoa* and *Tangaroa* have deployed 1,428 and 115 floats respectively, and of the 3,951 currently active floats, 688 were deployed by *Kaharoa* and 42 by *Tangaroa*.

The survey of Queen Charlotte Sound/Tōtaranui and Tory Channel/Kura te Au ... resulted in the most detailed picture of the physical and biological features of any region in New Zealand.

Long-running surveys track fish abundance

NIWA is New Zealand's predominant provider of fisheries stock assessment advice to the Crown, helping ensure sustainability of an export industry valued at $1.8 billion and employing 2,500 people.

Contracted by Fisheries New Zealand, NIWA surveys are crucial in informing the setting of the Total Allowable Commercial Catch to ensure New Zealand's fisheries remain sustainable now and into the future.

Deepwater and inshore fisheries trawl surveys have been run since the early 1990s. The abundance of up to 13 key commercial species and over 50 associated fish species is monitored, as well as information about species' size and age structure.

NIWA researchers conduct surveys every second year on the east and west coasts of the South Island (inshore) and on the Chatham Rise and subantarctic plateaus (deepwater).

This year, NIWA trawl surveys have contributed to Fisheries New Zealand-proposed catch increases for several species – including red gurnard on the east coast of the South Island, southern ling, and John Dory on the west coast of the South Island.

Elsewhere, NIWA completed another of the long-running annual dredge surveys of the Bluff oyster population in Foveaux Strait and the levels of infection with the parasite *Bonamia exitiosa*.

Top
Kaharoa from the sea on the crest of a wave.
(Hamish McCormick)

Bottom left
New charts for Marlborough Sounds.
(NIWA)

Middle
NIWA scientist Emma Jones and Blake NIWA Ambassador Victoria Carrington measuring fish on a month-long Chatham Rise fisheries survey.
(Monique Ladds, VUW)

Bottom right
Fisheries survey on *Tangaroa*.
(Ross Mitchell)

Biodiversity benefits

New Zealand's marine environment is home to tens of thousands of species, many of which are unique to New Zealand, making our part of the world a hotspot for biodiversity.

There are more than 300,000 specimens in NIWA's Invertebrate Collection, the result of about half a century of marine taxonomic and biodiversity research. This internationally significant collection is an invaluable resource for research in taxonomy, evolutionary biology, understanding marine ecosystems and biodiversity, ecological research, improving biosecurity measures and informing marine conservation.

Invasive species are a significant and growing threat in our oceans as well as on land, and NIWA is New Zealand's foremost authority in the presence and spread of invasive marine species. Our teams of highly experienced scientific divers are at the forefront of port and harbour surveillance throughout New Zealand, and we develop risk assessment approaches and tools to mitigate, manage or reduce risks and adverse impacts.

High-value finfish culture

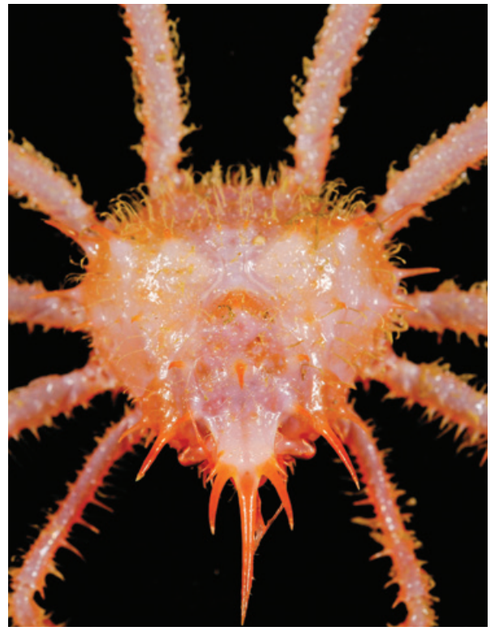
New Zealand's aquaculture sector has set a target of $1 billion in sales by 2025. Keys to achieving this include the commercialisation of high-value finfish such as kingfish and hāpuku, improving the yields from existing crops and gaining (retaining) access to suitable water-space. NIWA's world-class aquaculture facilities and specialists at the Northland Marine Research Centre and elsewhere are dedicated to these tasks.

The Northland research is focused on high-value finfish, devising production systems which are tailored to the individual species to ensure optimum development and product.

This research has enabled reliable production of multiple generations of captive-bred kingfish and hāpuku – the kingfish at commercial scale, and we estimate we will achieve comparable commercial capacity for hāpuku in 2020.

To complement this work, it is necessary to understand how aquaculture activities interact with the environment. NIWA has a research programme dedicated to understanding these interactions to help farmers develop supply chains which maximise the quality and quantity of production while minimising cost.

NIWA is also contributing to best practice guidelines for marine farming, and our modelling work is used to help the industry and regulators with decision making about farm locations.



Keys to achieving the target of $1 billion include high-value finfish such as kingfish.

Top
Kingfish at Bream Bay.
(Crispin Middleton)

Middle
Clown nudibranch at Poor Knights.
(Lucy Jacob)

Top right
Spider crab.
(Owen Anderson)

Bottom
NIWA diver Lily Pryor Rodgers monitors benthic species composition along the Otago Coast.
(Leigh Tait)

CRITICAL INFRASTRUCTURE

Sustaining our marine realm

With more than 15,000 kilometres of coastline, and extending from the Kermadecs into the Southern Ocean, New Zealand's marine realm is one of the world's largest Exclusive Economic Zones.

It is also one of the most diverse ocean research environments, and amongst the most challenging, ranging from deep ocean trenches to the wild waters of the Furious Fifties and Screaming Sixties.

NIWA's flagship deepwater research vessel *Tangaroa* is New Zealand's only ice strengthened and dynamic positioning system equipped deepwater research vessel, making it uniquely equipped to tackle these challenges.

Its DP2 dynamic positioning system means it can remain stationary in a wide range of conditions to deploy technical equipment for ocean sampling or track a precise path for seabed surveys.

It enables researchers to use high-tech sonar and acoustic equipment to scan the seabed and look deep into sedimentary layers below.

Tangaroa is in demand from researchers not just in New Zealand, but from all around the world, who recognise its suitability for marine research and its world-class capabilities.

World-class aquaculture research facilities

The growing global demand for protein and high-value food products from the sea is creating a significant economic opportunity for environmentally responsible and sustainable aquaculture.

NIWA is helping New Zealand's aquaculture industry achieve its target of $1 billion value by 2025. We bring together world-class research facilities at the Northland Marine Research Centre in Bream Bay and the country's largest team of aquaculture specialists to support the industry with unique science that underpins current and developing operations and innovation.

We devise production systems which align with the biological requirements of each species and market expectations, with a current focus on high-value finfish. This involves leading-edge husbandry systems, including marine recirculating aquaculture systems (RAS), animal behaviour and physiology, nutrition, health management, reproductive biology and genetics to ensure consistent, cost-effective supplies of healthy, high-performing juvenile finfish for ongrowing.

The facilities at the Northland Marine Research Centre are distinguished by the abundant supply of high-quality seawater. Our capacity to conduct photothermally controlled experiments under 'flow-through' conditions allows us to conduct experiments with the broadest possible utility for commercial end users.

The team uses technologies that include satellite data, in situ monitoring, controlled chambers and mathematical models to describe environmental fluctuations and longer-term trends which influence the performance of crops grown at sea.

Observing our atmosphere

NIWA's atmospheric research station situated at Lauder in Central Otago is well known and highly respected throughout the international atmospheric research community. Clear skies and geographical isolation make it perfect for observing atmospheric chemistry and radiation. The station, which has a wide range of world-class instruments, specialises in measuring CFCs, ozone, UV light levels and greenhouse gases.

Most of the measurements at Lauder use absorptions of short wavelength solar radiation or longer wavelength radiation emitted by the Earth's atmosphere.

The most notable exceptions to this are two complementary methods to measure the vertical profile of ozone. Every week, balloons are launched carrying sensors that directly measure ozone, humidity and temperature profiles up to altitudes of about 35 kilometres before descending back to the ground. These are complemented by a ground-based LIDAR (Light Detection And Ranging) instrument, which emits beams of pulsed laser light vertically to altitudes of about 100 kilometres. A small fraction of the light is backscattered by aerosols and atmospheric molecules, including ozone, and is collected by a telescope. Our measurements are submitted to major international databases.

Some Lauder measurements go back as far as 1980. These long-term datasets are extremely important to the scientific community in identifying small trends and changes over time.

National networking

NIWA's specialist climate and freshwater teams – the country's largest and most experienced – can call on a comprehensive network of environmental monitoring stations and supercomputing processing power for their science.

NIWA manages a network of more than 500 weather and climate-related stations across the country, providing detailed data from as far afield as Scott Base and the Chatham Islands.

This network provides an ever-growing dataset of readings, including air temperature, barometric pressure, wind speed and direction, rainfall, soil moisture and solar radiation. Thirteen specialist stations are sited thousands of metres up in some of New Zealand's most inaccessible regions, recording alpine weather conditions and snow and ice build-up.

In some sites, the data collected goes back to the early 1900s, and it is backed by ship measurements of sea-surface temperatures and marine night-time air temperatures from the oceans around New Zealand.

NIWA's freshwater specialists can call on an equally impressive network of national hydrometric and river water quality readings from indicator sites across New Zealand's 66,000 streams and river catchments.

NIWA's new multi-million-dollar investment in High Performance Computing represents a quantum leap in the processing power that can now be focused on turning all this data into detailed regional climate forecasts and catchment-level water flow and quality models.

Above
Tangaroa in the dry dock at Devonport.
(Stuart Mackay)

Middle
Kingfish at Bream Bay.
(Stuart Mackay)

Bottom
River gauging.
(Dave Allen)

TECHNOLOGY & DATA ANALYTICS

Making sense of Big Data

There are estimated to be six billion sensors currently connected to the internet, and that number is expected to mushroom to 20 billion in the next two years.

In New Zealand remote sensors monitor a myriad of environmental factors from atmospheric composition and ocean acidity to snow depth or soil moisture levels.

NIWA has recently invested $18 million in the supercomputing processing power of its High Performance Computing Facility (HPCF), and one of the many benefits is boosting NIWA's ability to effectively analyse the avalanche of data from this growing network of environmental sensors.

The three powerful Cray supercomputers in the HPCF can together process more than 1,400 trillion calculations a second – powerful enough to turn this flood of information into detailed national water flow models or paddock-level production feedback loops.

For example, NIWA is using data from remote river flow sensors, combined with rainfall readings and weather forecasts, to generate detailed hydrological models for New Zealand's 66,000 water catchments.

The results will enable central and local government to better manage future water allocation and prepare more resilient flood protection systems.

NIWA has also partnered with the agri-nutrients cooperative Ballance to provide high resolution environmental data and paddock-scale weather forecasts to thousands of farmers across New Zealand.

With NIWA's supercomputers capable of processing huge amounts of data in super-quick time, end users can now benefit from real-time feedback and data-powered decision making.

Top
HPCF 2018.
(Dave Allen)

Right
Servicing a solid precipitation gauge at Mt Larkins snow and ice climate station.
(Andrew Willsman)

WORKING WITH MĀORI

"Ehara taku toa i te toa taki tahi, engari he toa takitini"

Success is not the work of one, but the work of many

Te Kūwaha o Taihoro Nukurangi, NIWA's National Centre for Māori Environmental Research, is a unique resource within the national science system and provides NIWA with a dedicated research environment for delivering Māori research needs and aspirations. The team of Māori researchers works in partnership with whānau, hapū, iwi and Māori businesses to help them access and interpret NIWA's latest scientific knowledge, while also respecting the contribution of mātauranga Māori.

Examples of this include work with Ngāti Maniapoto to develop an inventory of repo (wetlands) and a decision support framework to prioritise wetland restoration efforts based on mātauranga-a-hapū, which included understanding the values, cultural significance, uses and resources associated with each repo.

NIWA's forecasting team works with Māori Television to produce nightly bespoke forecasts which combine our leading forecasting technology with mātauranga Māori around the lunar phases.

A four-year MBIE-funded research project is co-developing research methods, tools and products collaboratively with whānau, hapū, and iwi that will inform new and innovative management approaches for the protection, restoration and economic development of culturally significant species.

By working collaboratively with groups throughout Aotearoa on many different projects Te Kūwaha researchers are making a significant contribution to environmental sustainability, restoration and biodiversity.

Top
Tuna survey in Northland.
(Stuart Mackay)

WORKING IN THE PACIFIC

Making a difference in the Pacific

NIWA has long-standing relationships with Pacific Island nations, encompassing climate variability and change, natural hazards and resilience, hydrology and flood warning, tsunami modelling, water quality, village sanitation and fisheries management.

This year we reached a significant milestone in our support to Pacific Island National Meteorological and Hydrological Services, having now installed more than 200 weather, climate and hydrology stations throughout the region.

Pacific Islands are highly vulnerable to cyclones, floods, droughts and other weather and climate-related hazards. The high-quality weather, climate and hydrology information delivered through these monitoring stations enables these countries, their sectors and communities to better prepare for damaging weather events and future climate challenges.

We also work to increase the resilience of communities through the Ministry of Foreign Affairs and Trade-funded PARTneR project. This helps agencies to predict, plan and prepare for the harm caused by disasters by using RiskScape, a tool which estimates impacts and losses from natural hazards.

Our fisheries work focuses on helping Pacific Island nations develop well-managed, economically and biologically sustainable fisheries, with a current project in Tonga aimed at improving the nation's deepwater demersal line fishery.

In addition to delivering the best science, we are a long-term partner to Pacific Island nations, with a commitment to mentor, build and support capability development in the region.

Top
Mixing concrete for the installation of a weather station on Tanna island, Vanuatu.
(Dave Allen)

COMMUNICATING OUR SCIENCE

NIWA's science is fundamental to decisions on how New Zealand's natural resources are managed, but our scientists also make substantial contributions to the advancement of understanding nationally and globally.

The successful communication of our science facilitates its transfer and uptake, reinforces NIWA's position as the authority, and demonstrates the impartiality and value of our research.

Effective and engaging communication of our science is achieved by allocating considerable resources to making our stories resonate across every medium while tailoring products for different audiences.

One of the best examples of our effective communication in the past year was the March 2018 glacier survey.

We identified this annual flight over specific South Island glaciers to document the retreating snowline as a visually compelling opportunity to highlight our climate science and what the retreating snowline was telling us about our changing climate.

For the first time we invited media to join our climate scientists on the flight. We also made room for our videographers, who filmed the survey and produced a video of exceptional quality that, when posted on social media, was shared not only by the public, but also by leading politicians and influencers in New Zealand and internationally. Media coverage of the survey was also extensive and the story behind the retreating snowline was unequivocal – on the 40th anniversary of the glacier survey, after New Zealand's hottest summer on record and a marine heatwave, the snowline was higher than ever.

The value of outstanding videography continues to soar, and our video production increases in both volume and diversity of purpose as a result. We produce videos for client reports, public meetings, online news websites, social media, conferences and formal presentations. The Auckland-based weather forecasting team has also expanded its range of videos to include live streaming, seasonal climate outlooks and graphic visualisations using state-of-the-art technology.

We produced a video called 'Our World is Changing' to mark the opening of the inaugural Science New Zealand conference in November 2017. The video graphically illustrated how science conducted by the Crown Research Institutes was working to create a more prosperous, sustainable and innovative New Zealand. It has been used widely by CRIs and since been requested by several companies for screening at their own conferences as businesses consider science as a source of solutions.

Superb photographic imagery continues to be a NIWA strength and our annual staff photographic competition attracts a high number of entries and excellent media coverage.

Thousands of articles about NIWA's work appear in the media each year in publications that range from daily newspapers to trade and specialist magazines, and our science staff feature regularly in television and radio interviews outlining what their science tells us.

In the past year we have arranged two live ship-to-shore media interviews, one from aboard *Tangaroa* in the Southern Ocean during its 12th Antarctic voyage.

In June this year we brought a different kind of communication to Fieldays at Mystery Creek. We invited visitors to our stand to play an inventive game devised by our social science team to encourage farmers to be proactive in the face of climate change. The high level of engagement showed how effective gaming can be to communicate the practical reality of our science.

Our social media following has seen significant growth in the past year. Of note is the increase in the NIWAWeather Facebook reach, which has more than doubled its number of followers to over 10,000 and seen a 65 per cent increase in reach.

Our communication outreach programme includes being Principal Science Partner of the Sir Peter Blake Trust, the principal sponsor of seven main city science and technology fairs and eight regional fairs for school students, and award sponsors of the Sir Paul Callaghan Eureka Awards. These high-profile initiatives showcase the value of science to a wide audience.

During the year NIWA featured in mainstream media more than 5,300 times, attracting a total audience of more than 117 million – an increase of more than 30 million on last year.

1,366
Total science outputs

352
Commissioned client reports

101
Other reports

412
Published/submitted articles and books or book chapters

490
Presentations

Media

117,000,000
Total audience

114
Media releases

$22,000,000
Total equivalent advertising space rate

5,304
Number of items in mainstream media

Top
NIWA's Dr Andrew Lorrey points an FLIR T640 infrared camera out of the open cabin door towards the Tasman Glacier to gather thermal data for the glacier ice, meltwater and the debris cover.
(Dave Allen)

Middle
Ari, Kalarni and Nikau Henman from Awakeri playing the Climate Adaption Challenge at Fieldays.
(Sarah Fraser)

Bottom
A southern right whale surprises science staff in Wellington Harbour.
(Karl Halvorsen)

OUR PEOPLE

Delivering world-class science

Our people are at the forefront of scientific innovation, delivering relevant and objective scientific insights of the highest quality to help shape the environmental, economic and social future of the world we live in.

We are customer-centric, and our focus on continuous improvement and strategic collaborations facilitates the delivery of world-leading science.

NIWA diver Lily Pryor Rodgers surveying wharf piles in Bluff for invasive species.
(Peter Marriott)

A future-focused leadership and culture

The theme of the Leaders' Forum this year was 'Thinking about the next 25 years'. NIWA leaders met to analyse the past year's performance, engage with peers and stakeholders, and discuss organisational strategy. There was focus on the longer term operational vision, understanding the key drivers of future success and how to best leverage innovation, technology and science communication to maintain our high performing organisation over the next 25 years.

Our biennial staff survey was very positive, building on the favourable results of the 2016 survey, with improvements across all 16 survey categories. Three key themes consistently emerge regarding the aspects that staff most value about NIWA's work environment – the high calibre of colleagues; the varied, interested and challenging work; and workplace flexibility.

NIWA has well-established, flexible working practices to help staff balance both work and non-work commitments. For some staff this means working part-time for either a temporary period or on an ongoing basis, and 14% of our staff currently work part-time.

NIWA has ongoing engagement with employees and their representatives about improvements to workplace policies, guidelines and practices, and we sought input from employees and union delegates on several important policy updates this year. The Executive Team also met twice with a group of union delegates to share views and enhance mutual understanding and a positive relationship. A similar meeting with a group of non-union staff will occur early next year with the same aims.

NIWA is cognisant of the responsibility and importance of meeting the good employer requirements under Section 118 of the Crown Entities Act 2004, and we maintain People and Capability policies which are consistent with the fair and proper treatment of employees in all aspects of their employment.

Acquiring and retaining talent

Over the course of the year 15 new permanent positions were approved. Most of these were science positions, where there was an increased demand for our services. Science communication capability was also strengthened with the addition of four new positions which will enhance our ability to communicate the relevance of our science and its application to stakeholders and the wider public.

NIWA has a continued focus on the application of best practice recruitment processes, and all managers receive detailed training in recruitment, including regular refresher training. Recruitment panel members are also encouraged to attend a shortened recruitment workshop to become more familiar with our recruitment practices. NIWA takes a very

We are customer-centric, and our focus on continuous improvement and strategic collaborations facilitates the delivery of world-leading science.

Top
Divers Aleki Taumoepeau and Tracey Burton survey Mill Pond at Hobbiton, near Matamata.
(Paul Champion)

Top right
Researchers Brett Grant and Natalie Robinson drilling into the Antarctic ice.
(Gabby O'Connor)

Middle
Technicians Kat Reeve and Peter Williams measuring a longfinned eel at Donny Park, Hamilton.
(Sarah Fraser)

Bottom
Tangaroa crew Russel Jones and Pete Morrison at sunrise.
(Rob Stewart)

rigorous approach to selecting new staff, and we will make an appointment only when our selection criteria (which are set high) are very clearly met or exceeded.

NIWA's induction process includes both generic and job-specific resources, and inductions are evaluated via a post-entry interview to ascertain their effectiveness. Exit interviews are also offered to departing staff to give us insights into what they valued about their work experience at NIWA and any areas we could consider for potential improvement.

Each year NIWA undertakes an analysis of workforce demographics and People and Capability processes. The results for the 2017/18 year again indicated that our selection, promotion, remuneration and recognition processes are fair and non-discriminatory. One of the key observations from the gender demographics data was the continuing trend of more women than men in scientist and technician entry level positions.

NIWA's staff retention rate is consistently high, and was 93% for the past year.

A focus on ongoing talent development

NIWA proactively facilitates staff development through the Performance and Development Review process (which includes Individual Development Plans), and the annual Workforce Planning process. Staff identified as potential future leaders are an ongoing focus for accelerated development and retention. Succession plans are updated annually, and work transition plans are established for staff signalling retirement. Workforce analytics and ongoing operational workforce planning enable us to balance current market demand with anticipated future customer needs.

The People and Capability team facilitates the delivery of in-house leadership and management development learning opportunities, including workshops covering the following topics: Crucial Conversations, Recruitment and Selection, Developing Others, Challenge of Change – Resilience, Project Management, Inclusiveness in Action, Preventing and Responding to Unacceptable Behaviour and Understanding Domestic Violence. A variety of other regional seminars and workshops are also offered.

NIWA recognises that regular, profession-specific training is a key contributor to our ongoing success. We consistently invest in conference participation and other relevant professional development for staff. During the last year we spent almost $490,000 on professional development-related activities.

Most staff receive three personal development leave days per year and are encouraged to use this opportunity for broader personal development.

All NIWA policies, guidelines and practices are based on the principles of fairness, equity and non-discrimination.

Top
Scientist Leigh Tait examines the Kaikōura foreshore.
(Jo Bind)

Bottom
Sifting through the catch on board *Tangaroa*.
(Sarah Searson)

Enhancing diversity and inclusion

NIWA recognises that diversity has many dimensions, and we understand the importance and value of inclusive workplace practices for both staff and the organisation. All NIWA policies, guidelines and practices are based on the principles of fairness, equity and non-discrimination, and NIWA is an equal opportunities employer.

Workplace diversity and inclusion is an ongoing focus, and Inclusiveness in Action and Preventing and Responding to Unacceptable Behaviour workshops were delivered across NIWA's main sites. These courses were available to all staff, and there was an additional Preventing and Responding to Unacceptable Behaviour module offered for managers to ensure that they are well-equipped to effectively address any such situations, should they arise. The Unacceptable Behaviour Policy and Guidelines were also reviewed and updated to ensure they were contemporary and reflected best practice conflict resolution processes.

As part of NIWA's diversity and inclusion programme of work, we started the accreditation process for the Domestic Violence Free certification (DVFree) from SHINE – a family violence support organisation. The DVFree certification recognises the important role employers have in raising awareness of family violence, creating a safe working environment for staff experiencing family violence, and providing support for those staff to become safe outside of work. Initial Family Violence Contact Person training workshops were held, and manager training and a staff awareness campaign are planned for next year.

Another component of NIWA's diversity and inclusion activities has been working towards the Rainbow Tick accreditation. The Rainbow Tick is a confidence mark designed to show an organisation is a safe, welcoming, and inclusive place for people of diverse sexualities and gender identities (often known as the "Rainbow community"). The Rainbow Tick will allow us to more overtly demonstrate commitment to diversity and inclusion with respect to the Rainbow community, and the accreditation process will help identify where we might strengthen our activities in this area.

A spotlight on employee wellness

A new intranet Wellness Hub has been established with a range of physical, mental, financial and social wellness resources, and a lunchtime Wellness Seminar Series was offered across our main sites. Presentation topics included financial wellness, healthy nutrition, retirement planning and mindfulness. Feedback from staff was very positive, and in future we will hold a Wellness Month each year.

Mental health has emerged as an area of increasing relevance and importance, and a comprehensive mental health workshop has been identified for NIWA staff. This workshop focuses on identifying and dealing with mental health issues in the workplace and will be offered to managers and interested staff over the coming year.

With an ageing workforce, another developing focus is supporting staff with retirement planning and transition. A holistic retirement planning workshop, covering both lifestyle and financial planning, will be made available.

Recognising and rewarding our people

NIWA's primary strength and competitive advantage is its exceptionally talented people. The organisation has a strong ongoing commitment to recognising staff for their contribution, and we have a remuneration framework which includes regular market benchmarking to ensure that staff are appropriately rewarded.

In addition to our annual Performance and Development Review process, we also operate a manager-initiated relativity review process. Such reviews are requested by managers when an individual's overall capabilities indicate that a salary review would be appropriate. The proficiency analysis process takes a whole-of-job approach, considering proficiency relative to key performance indicators, performance and the extent to which behaviour is consistent with NIWA's core values. Internal and external relativities and affordability are key aspects of the associated remuneration evaluation. In the past year, there were 66 successful relativity reviews.

This year NIWA recognised 28 science staff with level promotions, following a comprehensive, peer-review process. Successful level promotions represent the culmination of years of dedication and commitment to high quality science and recognise the important contribution these staff are making in their fields of expertise. In particular, promotion to Principal Technician or Principal Scientist represents an exceptional achievement, and four technicians and four scientists were awarded such promotions for their significant ongoing contributions to both NIWA and the wider global science community.

NIWA made the decision to adopt the Living Wage as the minimum wage for any NIWA employee, effective from August 2018. Given the nature of our operations, we have rarely paid below the Living Wage, but the formal adoption of the Living Wage will ensure that this remuneration benchmark is consistently met.

Celebrating exceptional contributions

There is a rigorous peer-review selection process each year for NIWA's Excellence Awards which celebrate outstanding contributions. The depth of talent was again showcased at the awards ceremony recognising the achievements of the winners and runners-up in the 11 awards categories.

Celebrating photographic excellence is another key component of NIWA's Excellence Awards programme. Many of our staff get the opportunity to work in stunning and remote locations, and capture their extraordinary beauty. Their photos play a critical role in communicating our science and making it more accessible and relatable for our stakeholders and the public. Our annual photography competition is run across our regions, with five categories reflecting the areas in which our staff work.

Connecting with future science talent

NIWA recognises its key role in encouraging the scientists of the next generation. We actively engage with future scientists through sponsorship of seven main city science and technology fairs and eight regional fairs, with staff regularly involved as judges. We are also the platinum sponsor of the Sir Paul Callaghan Eureka Awards, with our Science New Zealand colleagues, and additionally sponsor an annual gold scholarship.

NIWA staff supervised about 75 PhD and MSc or Honours students from New Zealand universities, and we enabled more than 30 students from both New Zealand and overseas universities to undertake research alongside our experienced staff. We also offer PhD Scholarships and Postdoctoral Fellowship positions.

NIWA also provides Summer Internships each year, which gives science students a paid practical work opportunity. As Principal Science Partner of the Sir Peter Blake Trust, we offer up to six Blake Ambassador opportunities for young New Zealanders to advance understanding of some of the big environmental questions.

Top
Moturiki sea level stilling well maintenance, Mt Maunganui.
(Ben Harding)

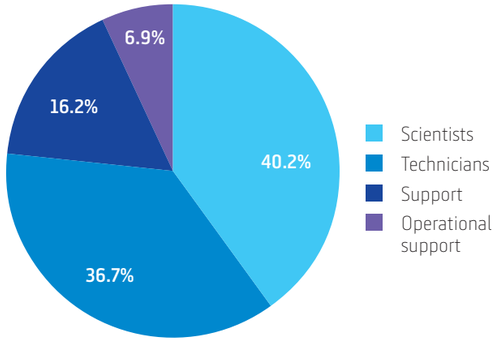
Middle
Students from the Sea Education Association on the bridge of *Tangaroa* with Skipper Doug Monks.
(Dave Allen)

Bottom left
Jon Stead carefully returns a tagged scampi to chilled water on board *Kaharoa*. These tagged scampi are returned for growth and stock studies.
(Crispin Middleton)

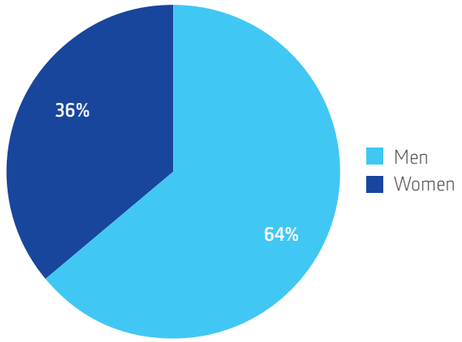
Bottom right
On the hunt for gastropods and bivalves, NIWA Blake Ambassadors Cheyenne Christensen-Field (left) and Kilali Gibson sieve core samples on *Tangaroa*.
(SPBT)

NIWA BY THE NUMBERS

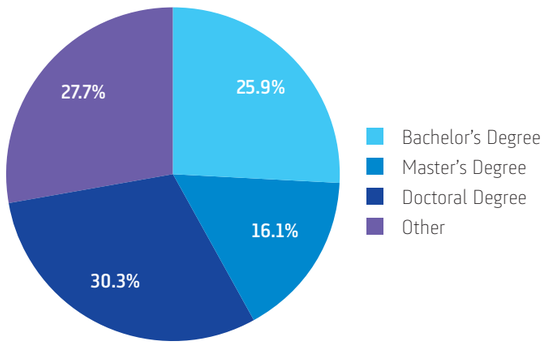
Roles



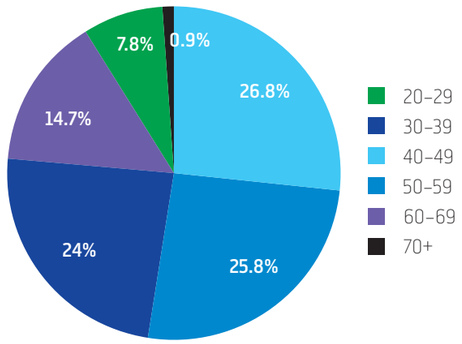
Gender



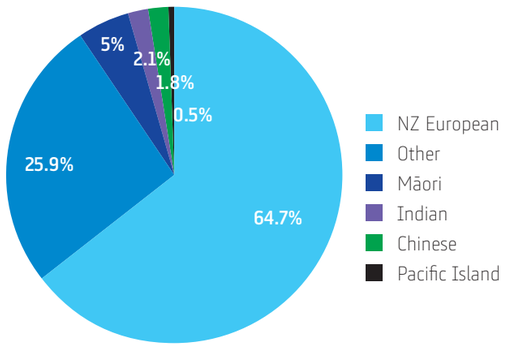
Highest Qualification



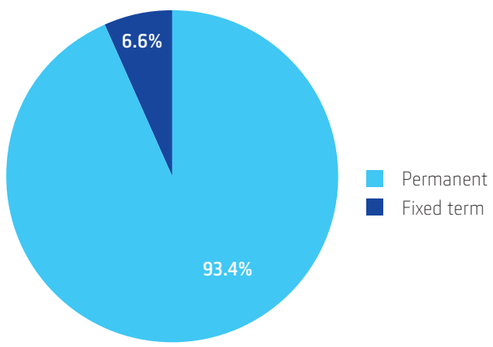
Age



Ethnicity



Employment status



NIWA Group by location

As at June 2018

679
NIWA Staff

86% Full-time

14% Part-time

Recruitment

15 approved new permanent positions

43 approved replacement permanent positions

13 approved fixed term positions

78 new employees

Turnover

NIWA Group – 6.7%

Personal Development Leave (NIWA Science)

3 days of Personal Development Leave are provided annually for staff, except those on management employment agreements

PSA membership

329

Disabilities

1.5% of staff have a form of disability

Remuneration reviews (in addition to standard NIWA annual process)

Operations Relativity Reviews	28
Support Relativity Reviews	38
Successful Level Promotions	28
Successful Salary Appeals	14
Total	**108**

OUR VALUES

NIWA's core values are part of our ongoing efforts to maintain a positive and strong culture, and be clear about what we need to promote, and stand for, in order to continue to be a successful organisation.

Bar-tailed godwit.
(Alvin Setiawan)

SAFETY

Working safely is paramount at all times.

- We take personal responsibility for the safety of ourselves and others
- We are always safety conscious, thinking "What am I about to do? What could go wrong? How can I do it safely?"
- We maintain high standards of safety in all working environments
- We report all hazards, incidents and near misses, acting on and learning from them
- We continually improve our safety systems and processes.

EXCELLENCE

We strive for excellence in everything we do.

- We apply the highest standards of rigour to our work
- We are creative and innovative in our thinking and apply leading-edge practice
- We are highly professional in the way we operate
- We are proud of our reputation for high-quality science
- We are efficient, effective and resourceful, seeking to eliminate waste and maximise opportunities.

CUSTOMER FOCUS

We provide our customers with an outstanding service and experience.

- We recognise that NIWA wouldn't exist without its customers
- We all work together to ensure a positive customer experience
- We value and respect our customers, and act to ensure excellent and enduring relationships with them
- We communicate with our customers openly and proactively
- We deliver on our commitments to customers – in full, on time and within specifications
- We seek customer feedback to help us improve.

AGILITY

We are agile, resourceful and responsive to opportunities and challenges.

- We actively create, identify and develop new opportunities
- We react quickly and flexibly to changing priorities
- We are positive, solution-focused and future-oriented in our outlook
- We recognise change as continuous, and treat it as an opportunity
- We are committed to continuous learning and improvement.

PEOPLE AND TEAMWORK

We are 'OneNIWA' and work collaboratively for the greater benefit of NIWA and our customers.

- We help and support our colleagues, treating each other with courtesy and respect
- We value diversity and respect other cultures
- We value the opinions, knowledge and contributions of others, and celebrate success
- We willingly share our expertise
- We all take responsibility for getting things done
- We listen openly and communicate honestly and constructively
- NIWA's interests and reputation take precedence over advancing our own individual interests and reputation.

INTEGRITY

We are honest, trustworthy and reliable in our work and our relationships with others.

- We uphold the highest ethical standards
- We deliver
- We take ownership and are accountable for our actions
- We provide accurate, evidence-based information and advice
- We maintain objectivity at all times, avoiding advocacy and bias
- We are viewed as trusted professionals in our areas of expertise
- We avoid or declare all conflicts of interest.

Last sunset, Scott Base Antarctica.
(Peter Marriott)

NIWA'S ORGANISATIONAL RESPONSIBILITY CHARTER

NIWA is committed to contributing positively to the social, economic and environmental wellbeing of New Zealand, as outlined in our Organisational Responsibility Charter below.

SOCIAL

NIWA is committed to work practices, operations and science outcomes that support our staff and the wider community.

We are committed to:

- Ensuring that people are safe in our workplaces
- Engaging positively with the communities in which we operate and live
- Respecting cultural values and diversity in New Zealand and in the countries where we work
- Fostering positive interactions with, and outcomes for, Māori.

ECONOMIC

NIWA is committed to operating with fiscal discipline to ensure that we retain our long-term viability and meet our core purpose science responsibilities to generate sustainable economic benefit to New Zealand.

We are committed to:

- Fair trading and observing high standards of behaviour, integrity and ethics
- Maintaining positive relationships with our customers, partners and collaborators
- Taking a broad approach to decision making and business development with the aim of benefiting all of New Zealand.

ENVIRONMENTAL

NIWA is committed to operating in an environmentally responsible way when carrying out our activities, and ensuring that we meet our core purpose science responsibilities to contribute to better environmental outcomes for New Zealand.

We are committed to:

- Minimising the environmental effects of performing our business
- Integrating environmental perspectives into our wider business planning
- Complying with all regulatory requirements, standards and best practice guidelines.

Operating to our Charter Principles

We must ensure that the commitments we give are owned by all our people and demonstrated by their actions.

SOCIAL

We will support the Organisational Responsibility Charter by:

- Being a good employer, particularly in relation to:
  - providing equitable access to employment opportunities
  - leadership, accountability and culture
  - recruitment, selection and induction
  - employee development, promotion and exit
  - flexibility and work design
  - remuneration, recognition and conditions
  - harassment and bullying prevention
- Treating our employees and all others with whom we interact with dignity and respect, including fostering long-term relationships built on trust and mutual benefits
- Ensuring staff have opportunities to participate in work-place improvement programmes
- Making available best practice systems and training to achieve a fit and healthy workforce
- Empowering our employees to identify and resolve safety concerns so that potential hazards are eliminated and safe processes and work methods are under continual improvement
- Maintaining open communication with local communities and ensuring our activities and staff respect their traditions and cultures
- Supporting our employees to participate in voluntary activities that benefit the wider community
- Working closely with individual employees to help them reach their goals and provide NIWA with talent for the future
- Striving for 'no surprises' in our internal and external relationships.

ECONOMIC

We will support the Organisational Responsibility Charter by:

- Being fair and honest in all our business dealings
- Maintaining objectivity in our service provision and avoiding actions that could damage NIWA's reputation for impartiality
- Taking a 'NZ Inc.' approach to business decisions and using any market advantage responsibly
- Delivering on our project commitments – on time, to budget and with the expected quality
- Employing our assets responsibly to benefit both the company and the wider community
- Abiding by the laws of the lands in which we operate
- Resolving differences without the need for litigation.

ENVIRONMENTAL

We will support the Organisational Responsibility Charter by:

- Ensuring that all our activities and assets comply with resource consents, relevant environmental standards, biosecurity and biodiversity regulations, and permitting requirements
- Maintaining full compliance with animal ethics procedures and ensuring that all sampling and work with live animals complies with the Animal Welfare Act 1999
- Minimising material waste and resource use, and making maximum practical use of recycling and electronic media
- Minimising energy consumption and greenhouse gas emissions, within the constraints of business sustainability
- Supporting our employees to take positive actions to reduce the effects of their activities on the environment at work and beyond.

NIWA Excellence Awards 2017.
(Hamish McCormick)

2018 NIWA

EXCELLENCE AWARDS

Our annual NIWA Excellence Awards – announced during the NIWA Leaders' Forum each year – celebrate the achievements of staff who have made an extraordinary contribution.

Staff are nominated by their peers, and finalists are then selected by a representative panel of staff, for ratification by the Executive Team.

2018 EXCELLENCE AWARD WINNERS

Craig Stevens

Research Excellence

Craig's research has provided a spine for underpinning science to develop better understanding of the physics of the oceans around New Zealand and how this influences the marine domain. He has used this as a bridge to connect with a range of disciplines – ecology, renewable energy, climate, sea ice – to build a better ocean research ecosystem. This has provided a strong point of collaboration both nationally and internationally, putting aspects of New Zealand's marine science on the map globally. He is also an excellent science communicator and a champion of science outreach.

Nicolas Fauchereau

Applied Science

Nico is a climate scientist who is developing NIWA's technical capability in big data analytics, an area of significant growth both nationally and internationally. His statistical and modelling skills have allowed him to create a predictive model that has successfully identified the impact of climate on retail sales. This model – the first of its kind for NIWA – provides valuable information for food and drink manufacturers and retailers, and is in demand from some significant clients.

Peter Sperlich

Early Career Science

Peter has quickly become a leader in novel isotope measurement techniques and a key member of the atmospheric research team, since joining NIWA four years ago. His contributions range from big-picture, hypothesis-driven research to key analytical development work that enables a wide range of science in New Zealand and overseas. In addition to leading successful proposals, he has a strong publication record and has developed important international collaborations.

Ben Noll

Science Communication

Ben is an outstanding communicator of all things meteorological. He is equally at home doing a radio interview, fronting a video, engaging in social media or talking to reporters. He also creates compelling infographics that help communicate the science behind NIWAWeather. The rapid increase in followers and engagement on NIWAWeather's Facebook and Twitter accounts are in large part due to Ben, and he is sought out by journalists for his knowledge and communication skills.

Darcel Rickard

Leadership

Darcel has displayed extraordinary leadership since being appointed group leader of Te Kūwaha o Taihoro Nukurangi 18 months ago. In addition to continuing with her own work commitments (ranging from wastewater treatments to tuna surveys) she has very successfully guided Te Kūwaha through a major reorganisation and restructure, creating a single, cross-site group, enhancing communication, aligning the group with NIWA's science structure and reinforcing the science expertise in the group.

Steve Wilcox

Project Delivery

Steve led the completion of NIWA's most complex coastal multibeam projects: the Queen Charlotte Sound/Tōtaranui and Tory Channel/Kura te Au hydrographic survey and habitat mapping and Cape Campbell–Kaikōura habitat mapping. Both presented unprecedented operational challenges because of their complexity, high cost, field and laboratory staffing demands, spatial extent, duration and the forces of nature – such as the November 2016 Kaikōura earthquake. Steve's profound technical knowledge and problem-solving skills were key to the projects' success.

Juliet Milne

Customer Focus

Juliet has made an outstanding contribution to enhancing NIWA's reputation with customers in the regional council sector. She has worked tirelessly to upskill and educate staff on the sector's science needs. Her competence, facilitation skills and focus on the customer's requirements ensures excellence in the delivery of projects. She rapidly assimilates the customer's needs, builds the appropriate team and delivers fit-for-purpose solutions, significantly improving the relevance and quality of NIWA's work for this key stakeholder group.

Tim Kane

Operational Innovation

Tim is a member of the Marine Geology group who has led the acquisition and processing of coastal multibeam data for habitat assessment through water column and backscatter analysis. He developed new visualisation methods for marine farm habitat assessment using water column multibeam backscatter data collected during the Queen Charlotte Sound/Tōtaranui and Tory Channel/Kura te Au hydrographic survey, and streamlined data processing to build innovative products which received high praise from international reviewers.

Alan Grey

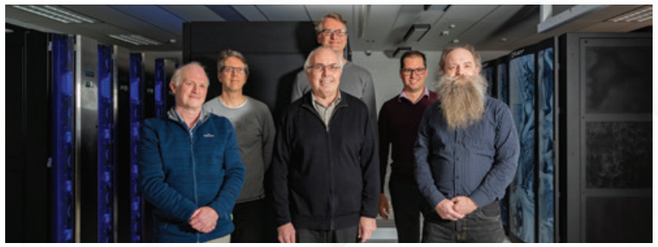
Support Services

Alan's reliability, gentle approach, attention to detail, positive attitude and extensive experience make him central to NIWA's strong standing with MBIE and other organisations. He is dedicated to getting the best results for NIWA and plays a critical role in maintaining our government research funding via annual application, contracting and reporting processes. He works untiringly to meet MBIE requirements and guide staff in proposal writing, contracting and reporting, and his support significantly reduces the workload of science staff.

Chris Wood

Health & Safety

Chris displays exemplary leadership and dedication to safety in the Marine High Risk Site Surveillance programme, which involves extensive travel, boating and diving activities of more than 40 staff NIWA-wide annually. He leads by example and has been unwavering in his commitment to ensure the project has an outstanding safety record. He is continually working on and improving project health and safety plans and actively produces task-specific standard operating procedures to manage hazards.

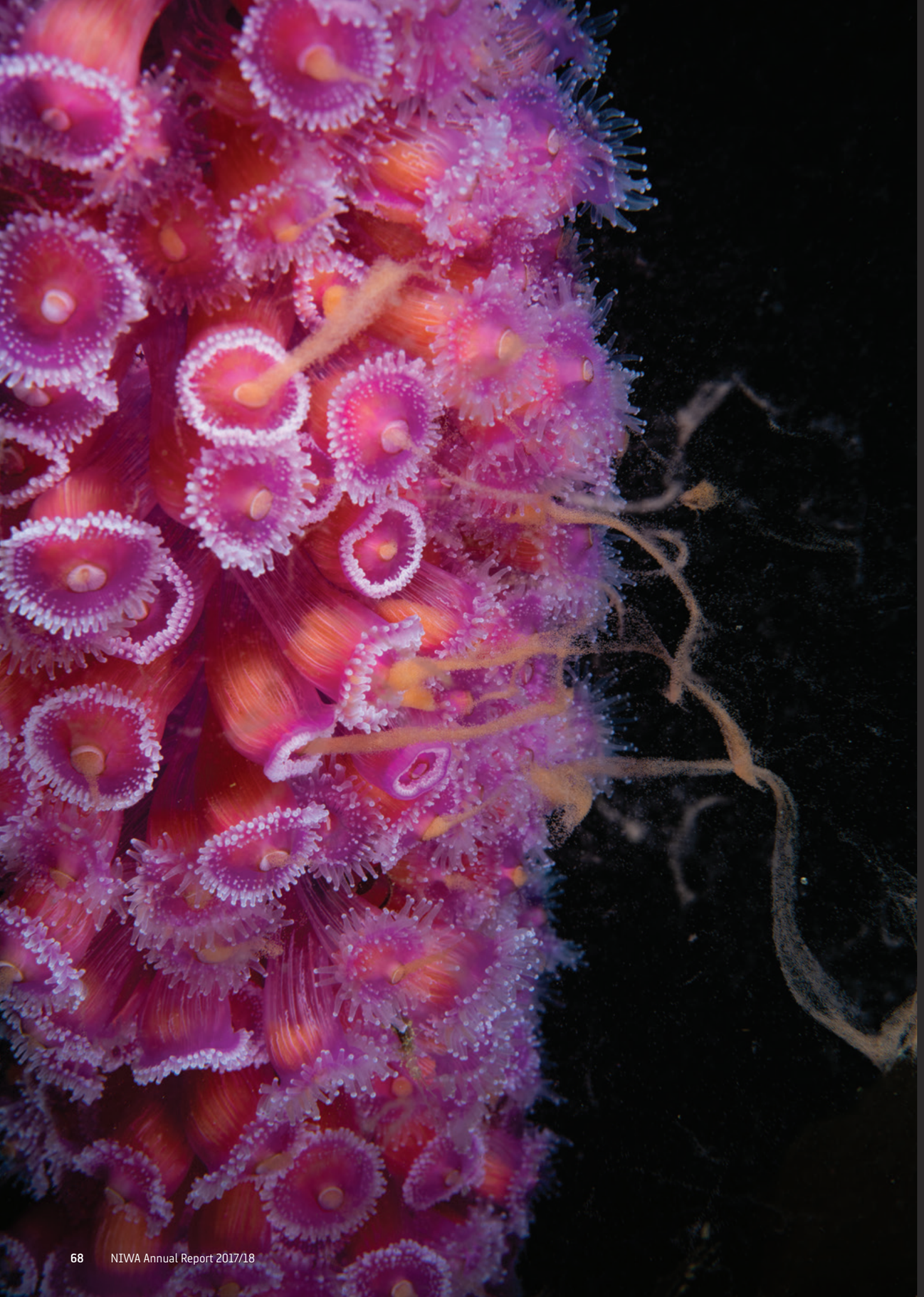


High Performance Computing Facility Team

Team Excellence

This team led the installation of NIWA's new supercomputers, a hugely complex task involving the transition of both NIWA operations and NeSI research services from the incumbent FitzRoy to its replacements Māui and Kupe and the integration of a third supercomputer Mahuika into the new high performance computing facility. This was a vast effort that included overcoming critical technology challenges, the movement and reconciliation of 5PB of data comprising more than 100 million user files between sites, user requirements gathering, and user training. The success of this transition provided evidence of NIWA's capability, enhanced our reputation within the wider high performance computing community in New Zealand, and demonstrated the team's capabilities at managing leading edge, highly complex, technologies.

From left to right
Errol Lewthwaite, Bernard Miville, Michael Uddstrom, Wolfgang Hayek, Fabrice Cantos, Aaron Hicks.



2018 NIWA

PHOTOGRAPHY AWARDS

This year's NIWA staff photographic competition is a testament to the extraordinary landscapes our staff work in.

From sea floor to mountain top, the scale and detail of New Zealand's beauty has been skilfully captured and displayed.

This year the judges were Gerry le Roux from Science Lens, Ross Giblin of Stuff and NIWA photographer Dave Allen, who admired the technique, expertise and magic behind the lens.

Many of the images entered will feature on the NIWA website, our calendars, our magazine *Water & Atmosphere*, social media and a wide range of other publications, like this annual report.

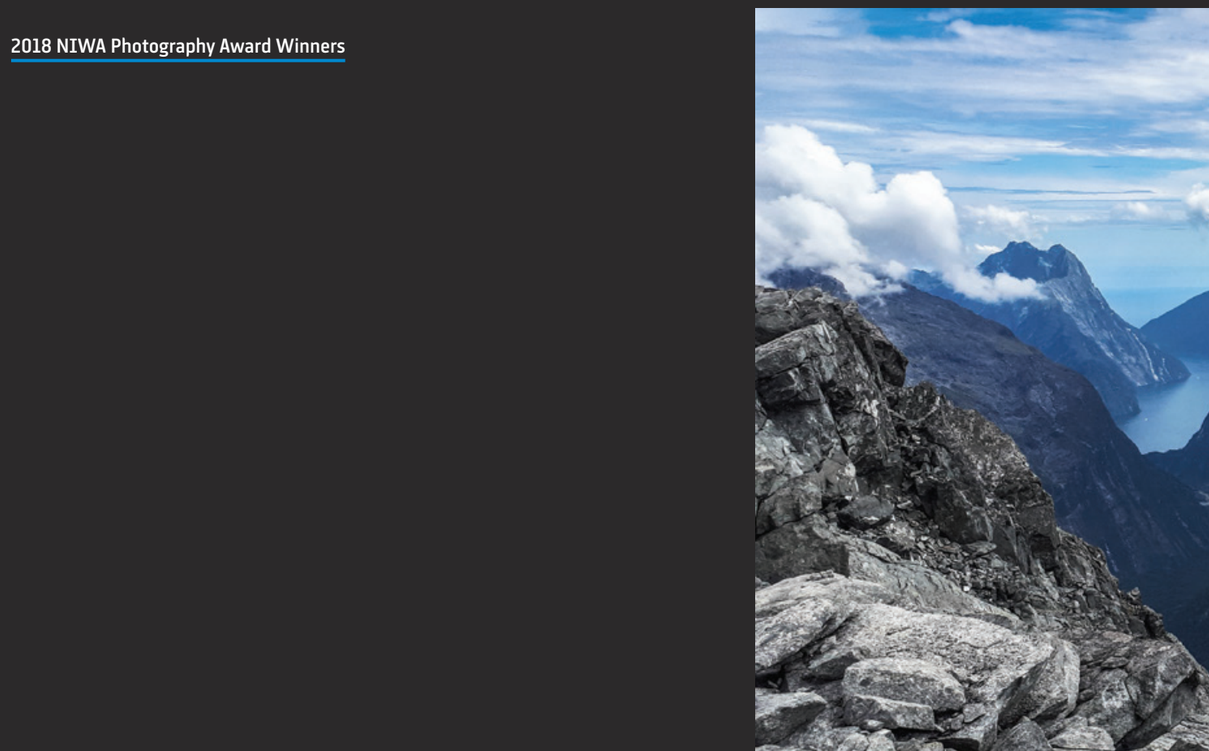
Our Work (left)

Crispin Middleton
Spawning jewel anemone

Jewel anemones spawn once a year, and the event only lasts between 10 and 20 minutes. It is carefully coordinated with the tide and the cycle of the moon.

Crispin captured this shot on the wreck of the *Canterbury* in Deep Water Cove in the Bay of Islands – after going there specifically to record this rare event. "Interestingly, jewel anemones seem to spawn in some kind of colour order, pink first and then brown."

He loves the sense of movement in the shot, but the judges were captivated by the gorgeous light and colour.



Our People (left)

Jo Bind

Assessing grain sizes above Lake Pukaki

This was taken at the mouth of the Tasman River, near Glentanner at the head of Lake Pukaki, while Jo and Julian Sykes were sampling and mapping distribution of fine sediment. It was mid-winter and extremely cold, a situation exacerbated by the pair having to complete numerous cross-sections of a 4km-wide river bed.

"The setting is just spectacular – surrounded by New Zealand's highest mountains, standing in a river that drains from two massive glaciers. It's a great memory of a great bit of field work and captures so much of what that work encompasses at NIWA."

The judges commented on the great balance of colour and composition that brought together the environment, the work and the people exceptionally well.

Emerging Photographer

Elliot Bowie

Barrier Knob – a true Fiordland experience

The summit of Barrier Knob, above Gertrude Saddle in Fiordland, provides the perfect opportunity for a breathtaking photograph. It is a shot the judges say captures the majestic feel of the mountains with the bald rocks in the foreground receding into sea and sky. They say the perspective makes the viewer feel as if they are standing on the edge.

Elliot says he loves the photo because it portrays the landscape of Fiordland really well. "From the sea to the rugged mountains, it's all there."

He recommends the climb: "It's definitely worth it."

Our Places (below)

Crispin Middleton
Reduced visibility, Blue Maomao Arch, Poor Knights Marine Reserve

It was the stunning use of light, composition and blue palette that caught the judges' eyes – especially the shaft of light seemingly lifting the diver away from the massive shoal of fish.

Crispin says the arch is always beautiful, but is particularly special in winter. "The low light beams through cracks in the roof of the arch. Timing is everything though, the light only streams in for an hour or so."

A commonly dived spot, Crispin says it's an easy dive or snorkel and well worth the visit.

Coasts and Oceans

Peter Marriott
Where the land meets the sea ice

Simply extraordinary, the judges said. Adding that it's a rarely seen view of sea ice and the critters that live among it – an intriguing photo that immediately catches the eye. "Beaut use of colour and form."

Peter took this photograph under the sea ice in New Harbour, Antarctica while he was diving for an ecological research programme.

He says it graphically shows the transition of land to sea, water to ice from a perspective few people get to appreciate. "Where the fast sea ice joins the land, the folds and cracks in the roof are from the sea ice sheet flexing as the tides go in and out. I like the soft lighting, and the large platelet crystals of the ice forming on the seabed."

Special Award

Jo Bind
A calm day at Little Pigeon Bay

The judges described this shot as ethereal, stark and beautiful. They remarked on the effective use of long exposure and the strong, punchy use of black and white to achieve the smoky water and dramatic sky.

Jo says on the day he was there, the light wasn't particularly interesting. "Fortunately, I had a strong neutral density filter that allowed me to create a much more interesting image. It works well in black and white due to the contrasts in the scene. In colour it would be a very different image."

He particularly likes the contrast of the "dreamy, soft water and sharp, defined, land features."

BOARD OF DIRECTORS

Barry Harris

Chairman

Barry is a company director with extensive governance and executive experience. He has held several chief executive roles, including Environment Waikato, Greater Wellington Regional Council and Hamilton City Council. He was also a senior executive with Fonterra for five years. Barry is currently chair of Food Innovation Waikato, Wintec, McFall Fuels and OSPRI, and is a director of DairyNZ and WEL Networks Limited. He is also a member of the Waikato River Authority. Previous boards include CentrePort, RD1, AgResearch, International Nutritionals, Agricultural Services Ltd, Primary ITO, Hamilton Riverside Hotels and Local Authority Shared Services. Barry has a Master of Agricultural Science (Honours). He was appointed Chairman of NIWA in July 2018.

Nick Main

Deputy Chairman

Nick is a Chartered Accountant and was CEO and later Chairman of Deloitte in New Zealand. More recently, he was Deloitte's Global Managing Partner of Sustainability and Climate Change Services and Global Chief Sustainability Officer, based in London. He has also served as Deloitte's Global Chief Ethics Officer. Nick currently chairs the Middlemore Foundation for Health Innovation, chairs the Westpac New Zealand Sustainable Business External Advisory Panel, and is a member of the Westpac Australia Stakeholder Advisory Council and a trustee of the Sir Peter Blake Trust.

John Morgan

Chief Executive

John joined NIWA as CEO in April 2007. He has extensive senior executive and governance experience in public and private sector organisations covering a range of markets and activities, including business, science, education and sport. His science sector roles have included Chairman of Science New Zealand, CEO of AgriQuality Ltd, Executive Director of Orica New Zealand Ltd, and Chairman of New Zealand Pharmaceuticals Ltd. John is passionate about the role science can play in transforming New Zealand's economy, environment, society and global reputation.

Dr Helen Anderson

Helen chairs the BRANZ Board and is an independent director of DairyNZ, Antarctica NZ and Lincoln Hub Ltd. She is Pro-Chancellor of Massey University and is a member of the National Council of the Institute of Directors. She was Chief Executive of the Ministry of Research, Science and Technology for six years, preceded by six years as Chief Science Adviser. Helen chairs or is a member of advisory boards for DIA, MBIE, NZ Police and ClearPoint Ltd. She has a PhD in geophysics from Cambridge University and enjoys keeping up-to-date with the latest science developments.

Dr Tracey Batten

Tracey has 15 years' experience as CEO for large healthcare organisations in both Australia and the UK and has worked closely with businesses in the hospital, aged care and medical research sectors. Tracey was Chief Executive of Imperial College Healthcare NHS Trust in the UK. Prior to that she was Chief Executive of St Vincent's Health in Australia. She has held governance positions with private and public organisations and is a director of Abano Healthcare and Medibank Private Limited. Tracey qualified as a doctor at the University of Melbourne and has a Master of Health Administration from the University of New South Wales and an MBA from Harvard.

Prof. Gillian Lewis

Gillian is a Professor of Microbiology in the Faculty of Science at the University of Auckland. She was formerly Associate Dean of Research and Head of the School of Biological Sciences. She is University Proctor and has several leadership roles, including with the Joint Graduate Schools between the Faculty of Science and CRIs or research organisations. Gillian is a former President of the New Zealand Microbiological Society. She has a PhD in Microbiology from the University of Otago. Her research focuses on the interactions of complex microbial communities and their response to natural and anthropogenic impacts in freshwater environments.

Mary-Anne Macleod

Mary-Anne was Chief Executive of Bay of Plenty Regional Council from 2011 until she resigned in 2018 to pursue a governance career. She was previously the council's Group Manager Strategic Development and had held several senior positions in central government departments, including the Ministry for the Environment. Mary-Anne has also worked in international consultancies specialising in environmental management. She has held governance roles with Bay of Plenty Shared Services Ltd, Quayside, and the Tauranga and Western Bay of Plenty Economic Development Agency, Priority One. Mary-Anne has a Master of Science (Hons) in Earth Sciences and Geography.

Mike Pohio

Mike is a Hamilton-based director. Mike currently holds directorships on the boards of Panuku Development Auckland, KiwiRail, OSPRI and Te Atiawa Iwi Holdings. He is also Chairman of BNZ Partners, Waikato Region. He was the CEO of Tainui Group Holdings from 2006 to 2015. Mike holds an MBA from IMD, Lausanne and an FCA from the Chartered Accountants Australia & New Zealand.

Sculptured pressure ridges, Scott Base.
(Gordon Brailsford)

EXECUTIVE TEAM

John Morgan
Chief Executive

John joined NIWA as CEO in April 2007. He has extensive senior executive and governance experience in public and private sector organisations covering a range of markets and activities, including business, science, education and sport. His science sector roles have included Chairman of Science New Zealand, CEO of AgriQuality Ltd, Executive Director of Orica New Zealand Ltd, and Chairman of New Zealand Pharmaceuticals Ltd. John is passionate about the role science can play in transforming New Zealand's economy, environment, society and global reputation.

Geoff Baird
General Manager, Communications & Marketing

BSc Hons (Ecology), Victoria University of Wellington

Geoff has extensive experience in science publishing and communication from working with the Ministry of Agriculture and Fisheries, MAF Fisheries and NIWA. He became NIWA's Communications Manager in 2003 and General Manager, Communications and Marketing in July 2007, with a focus on reinforcing the values underlying the NIWA brand, enhancing communication and uptake of NIWA's science and demonstrating how NIWA enhances the benefits of New Zealand's natural resources.

Patrick Baker
Chief Financial Officer

MEng, Brunel University, London; BBus (Accounting and Management), GDip (Professional Accounting), Open Polytechnic of New Zealand; CA

Patrick is a Chartered Accountant. He began his career as an engineer with Ford Motor Company in the UK before moving into financial management. He served in senior country finance management positions in Europe and the Middle East before joining Ford New Zealand in 2004. After choosing to settle permanently in New Zealand in 2012, he was appointed CFO of The Network for Learning Limited, a Crown company established to deliver managed internet services to New Zealand's schools. He joined NIWA as CFO and Company Secretary in May 2014.

Dr Barry Biggs
General Manager, Technology and Innovation

BSc Hons (Botany and Geology), Victoria University of Wellington; PhD (Stream Ecology), University of Canterbury

Barry is an environmental scientist with over 40 years' research and commercial science experience, having specialised in the assessment of the effects of changes in land use and flows on river ecosystems. He has been extensively involved with planning and running some of New Zealand's largest RMA consenting projects. He was NIWA's Christchurch Regional Manager for four years, Chief Scientist of Environmental Information and Pacific Rim for three years, General Manager, Operations for ten years and was appointed to the role of General Manager, Technology and Innovation in July 2018.

Meryl Baker
Executive Assistant to the NIWA Board and Chief Executive

Dr Bryce Cooper
General Manager, Strategy

PhD (Microbiology), University of Waikato

Bryce is a graduate of the London Business School Senior Executive Programme. He has held research leader and regional manager roles in NIWA, and currently oversees NIWA's strategy development, including initiatives to transfer research to end users and the building of partnerships with businesses and central and local government.

Dr Mary-Anne Dehar
General Manager, People and Capability

PhD (Psychology), PGDipPsych (Comm), University of Waikato

Mary-Anne is a registered psychologist, specialising in industrial/organisational psychology. Before joining NIWA in 2008, she practised as a consultant psychologist for 15 years, both in private practice and for several large consulting firms. Prior to that she worked in evaluation research with a range of community, justice, public health and health promotion programmes. Mary-Anne has extensive experience in psychological assessment, learning and development, executive coaching, leadership development, and organisational change and performance improvement initiatives.

Dr Rob Murdoch
General Manager, Research

PhD (Marine Science), University of Otago

Rob has a specialist interest in oceanography and marine ecology, and has been a practising scientist on projects associated with the Southern Ocean, aquaculture, oil and gas exploration and marine conservation. He has overseen the planning and direction of NIWA's science and the operation of the research vessels since 1999, and helps manage NIWA's relationships with key stakeholders and collaborators.

Dr Helen Neil
General Manager, Operations

PhD (Earth Sciences), University of Waikato

Helen is an experienced geologist with interests in seabed mapping, oceanography, and stable isotope geochemistry. Her expertise has been applied to the management and delivery of large-scale, multi-disciplinary projects and research voyages associated with seabed surveys, telecommunication cables, marine infrastructure, and ocean exploration in the subtropical and subantarctic oceans around New Zealand. Helen previously led the Ocean Sediments Research Group, joined the Operations Management Team in 2016 as National Projects Manager, and was appointed General Manager, Operations in July 2018.

Galapagos shark off Raoul Island. *(Crispin Middleton)*

SCIENCE MANAGEMENT TEAM

Andrew Forsythe

Chief Scientist, Aquaculture

DVM, University of Prince Edward Island

Andrew joined NIWA in 2005, bringing with him more than 20 years' experience in the North American and European aquaculture industries. He has extensive expertise in the design and operation of recirculating aquaculture systems, has provided ambulatory veterinary services for commercial and enhancement aquaculture in western Canada, and has managed freshwater production for a major salmon farming company. Andrew took up his current role as NIWA's Chief Scientist, Aquaculture, in 2007.

Dr Sam Dean

Chief Scientist, Climate and Atmosphere, Natural Hazards

PhD (Physics), University of Canterbury

Sam began his research career with a postdoc in the Atmospheric, Oceanic and Planetary Physics Department at the University of Oxford (UK), before he joined NIWA in 2006. He is an expert on the use of climate models to understand the drivers of climate variability in New Zealand and Antarctica, and, in particular, human-induced climate change. His research has been able to identify the contribution of human-induced warming to intensifying New Zealand weather extremes, including droughts and floods. He is part of a team investigating the interactions between Antarctic sea ice, atmospheric circulation and the Southern Ocean. He commenced his current management role in 2015.

Dr Barb Hayden

Chief Scientist, Coasts and Oceans

PhD (Marine Biology), University of Otago

Barb has a research background in marine biosecurity and the environmental sustainability of aquaculture. Today she leads NIWA's coasts and oceans research, which focuses on ecosystem-based approaches to managing activities in New Zealand's marine estate, so that economic and social benefits are realised while vulnerable components of the ecosystem are protected.

Dr Jochen Schmidt

Chief Scientist, Environmental Information

PhD (Geography), University of Bonn

Jochen has a background in hydrology, geomorphology, soil science, geo-informatics, and hazards and risk assessment. He worked for Landcare Research from 2001 to 2003, where he was instrumental in developing the New Zealand Digital Soil Map ('SMAP'). He joined NIWA in 2003 and coordinates systems for collecting, managing and delivering environmental information – ensuring they are robust and meet best-practice standards. Jochen leads NIWA's engagement with the primary sector.

Dr Rosemary Hurst

Chief Scientist, Fisheries

PhD (Zoology), Victoria University of Wellington

Rosemary has worked in fisheries research in New Zealand since 1979. She is a specialist in middle-depth and inshore fisheries resource surveys and stock assessment and has also conducted research on fish communities, ocean climate effects on fisheries, and trawl catchability and selectivity. She was a regional manager at NIWA Wellington for eight years and has been in her current role since 2010.

Dr John Quinn

Chief Scientist, Freshwater and Estuaries

PhD (Biotechnology/River water quality), Massey University

John has worked in freshwater research and management in New Zealand since 1980. He is a river ecologist with expertise in land-water interactions, riparian management, water quality, and invertebrate ecology. He has led NIWA's research in aquatic restoration for over a decade and took up his current role in 2015.

Greg Foothead

General Manager, Vessel Operations

NZCE (Mechanical), Central Institute of Technology

Greg is a certified automotive engineer. Before joining NIWA Vessels as Engineering Manager in 2004, he managed a marine and industrial supply and repair company. He has also worked for Mitsubishi Motors, in various technical roles, in New Zealand, Australia and Europe. Greg has managed NIWA's research vessels *Tangaroa, Kaharoa* and *Ikatere* since December 2010.

Dr Scott Larned

Manager, Freshwater Research

PhD (Ecology and Evolution), University of Hawai'i

Scott has carried out environmental research in a wide range of settings, including rivers, temperate and tropical rainforests, coral reefs, estuaries, lakes and aquifers. He is a specialist in nutrient dynamics and algal ecology. At NIWA, Scott has led projects and programmes in water quality, environmental flows, invertebrate and periphyton ecology, and surface water-groundwater science. Scott has been a principal scientist at NIWA since 2008 and is a programme leader in the *Our Land and Water* National Science Challenge.

Dr Mark Bojesen-Trepka

Manager, Marketing and Industry Engagement

BSocSc, MBA, PhD (Marketing and Technology Management), University of Waikato

Mark is an industrial marketer, and has led the marketing, product development, technology-transfer and business-development effort for a number of firms in the plastics, steel and primary sectors. Past roles include National Marketing Manager for BHP Steel Building Products, National Marketing Manager for ICI Resins and Adhesives Division and General Manager for NorthFert.

Rob Christie

Manager, Marine Resources

BSc (Hons) (Environmental Science & Technology), Middlesex University, MCIWEM, CSI

Rob is a chartered scientist with more than 20 years' international experience. He has held senior management positions in environmental consultancy and science sectors in the UK, Australia and New Zealand. Rob joined NIWA in 2013 and manages NIWA's marine resources and the application of NIWA's marine science. He also oversees NIWA's maritime fleet.

Marino Tahi

Manager, Māori Strategy & Engagement

MBA, Massey University, BA (Māori Resource Management) and BCA (Management and commercial law), Victoria University of Wellington

Marino leads the Te Kūwaha National Science Centre, and works across NIWA to maximise the transfer of natural resources and environmental science knowledge to Māori entities and communities. His tribal affiliation is Ngāi Tūhoe, and he comes from Ruatahuna, a small settlement in Te Urewera. He joined NIWA from Landcare Research, where he was the Māori Partnerships Manager – Business Development for nine years. He currently chairs Te Ara Pūtaiao (TAP), a collective of Māori managers and scientists from across the Crown Research Institutes, mandated by Science New Zealand.

Alan Grey

Manager, MBIE Research

MSc Hons I (Geology), University of Canterbury; PGDipSSER, Massey University

Alan has a background in ecology and earth sciences. He has extensive experience in research administration and science and technology programme evaluation. He oversees NIWA's obligations to government funding agencies, responsibilities for undertaking research for the benefit of all New Zealanders, and evaluation of the impact and value of NIWA's research.

Douglas Ramsay

Manager, Pacific Rim

BEng (Civil Engineering), University of Aberdeen; MSc (Water Engineering), University of Strathclyde; MBA, University of Southern Queensland; CEng; MICE; MCIWEM; FRGS

Doug is a chartered engineer. He joined NIWA in 2003, following roles with HR Wallingford in the UK and the Government of Kosrae in the Federated States of Micronesia. He specialises in coastal hazard management and coordinates NIWA's international commercial work, focusing on the Pacific and Asia regions.

Dr Alex Thompson

Manager, Research Development and Engagement

PhD (Atmospheric Chemistry), York University of Canada

Alex joined NIWA after a decade in government in climate policy advice and as a science investment manager. Before returning to New Zealand, Alex was a founding editor of *Nature Geoscience*, and previously held scientist roles at British Antarctic Survey in Cambridge UK, University of California at Berkeley, and Forschungszentrum Jülich in Germany. Her research expertise is in the use of stable isotopes to understand emissions of gases from the earth's surface and their impact on the atmosphere.

OPERATIONS MANAGEMENT TEAM

Ken Becker

Regional Manager, Auckland and Bream Bay

BSc Hons (Marine Biology), University of Liverpool; PGDip (Professional Ethics), University of Auckland

Ken has nearly 40 years' experience in marine science. Before joining NIWA as a regional manager in 2005, he worked for Auckland Regional Council on resource management regulation, planning and policy development in water quality, wastewater treatment, stormwater management and water resource allocation.

Dr Michael Bruce

Assistant Regional Manager, Auckland

PhD (Aquaculture), University of Stirling

Michael's background is in fish nutrition and he has more than 25 years' experience in aquaculture research and working with industry. He joined NIWA in 1999 and was appointed Assistant Regional Manager for Auckland in 2011, with operational responsibility for the Northland Marine Research Centre at Bream Bay. As well as a broad range of operational management skills, Michael also leads the Aquaculture Production science programme.

Dr David Roper

Regional Manager, Hamilton

PhD (Marine Science), University of Otago

David has more than 35 years' experience as an environmental scientist working for NIWA and within the power industry. His specialist areas are marine and freshwater ecology, ecotoxicology, environmental impact assessment and resource management. David has been Regional Manager in Hamilton since 2002.

Dr Andrew Laing

Senior Regional Manager, Wellington and Lauder

PhD (Fluid Dynamics), University of Canterbury

Andrew is a marine meteorologist and physical oceanographer with nearly 40 years' experience in science research and operational management. He has conducted research at the New Zealand Meteorological Service, in the UK, and at NIWA, and led a research group in NIWA before becoming a full-time Regional Manager in 2000 and then Senior Regional Manager in 2008, with a focus on staff and operations management. He has also represented New Zealand in intergovernmental forums.

Dr Julie Hall

Regional Manager, Wellington

PhD (Aquatic Toxicology), University of Manitoba

Julie is a marine and freshwater biologist who has spent more than 20 years working for DSIR and then NIWA, specialising in phytoplankton, microbial food web and zooplankton studies in both marine and freshwater. She chaired an international research programme investigating the impact of global change on marine foodwebs and biogeochemistry. She was a group manager at NIWA in Hamilton before joining the Operations Management Team in Wellington in 2008, where her focus has been on staff, project and operations management. In 2015 Julie was appointed Director of the *Sustainable Seas* National Science Challenge and now divides her time between this position and her role as Regional Manager in Wellington

Dr Alison MacDiarmid

Regional Manager, Wellington

PhD (Zoology), University of Auckland

Alison specialises in behavioural ecology, with broad interests in coastal reef ecology and management, marine ecosystem risk assessment, closed area management, and historical marine ecology. She leads NIWA's Marine Ecosystem Trophic Structure and Function Programme within the Coasts and Oceans Science Centre. Alison joined the Operations Management Team in 2015 where her focus is on staff, project, and operations management, with particular responsibility for health and safety. She also chairs NIWA's Emergency and Crisis Management Critical Risk Team.

Dr Helen Rouse

Regional Manager, Christchurch and Nelson

PhD (Physical Geography), University of Hull

Helen trained as a coastal geomorphologist with a PhD from the University of Hull, UK. She has been in New Zealand for over 20 years and, in that time, has worked as a teaching and research fellow at Lincoln University, as Environmental Information Manager at the West Coast Regional Council, and as a national advisor for the Tertiary Education Commission. She joined NIWA in 2007, first as a resource management scientist specialising in the boundary between science and policy, then from 2014 as National Projects Manager. She has been Regional Manager of the Christchurch region since January 2016 and of the Nelson region since April 2017.

Charles Pearson

National Manager, Environmental Information Operations

BSc Hons (Statistics), University of Canterbury; MSc Hons (Engineering Hydrology), National University of Ireland

Charles is a hydrologist specialising in the analysis of hydrological and other geophysical and climatological data for purposes such as estimating flood risks. He is also the World Meteorological Organization's Hydrological Adviser for New Zealand. Charles has extensive staff and operations management experience, becoming full-time Regional Manager for Christchurch in 2006. He was appointed to the new position of National Manager, Environmental Information Operations in January 2016.

Dr Phillip Jellyman

Assistant Regional Manager, Christchurch

PhD (Ecology), University of Canterbury

Phil is a freshwater fisheries scientist who first worked with NIWA in 2005–07 and has been back as a scientist since 2012, specialising in freshwater resource management and conducting research on freshwater fisheries and food webs. He leads the freshwater fisheries research within the Sustainable Water Allocation Programme. Prior to becoming Assistant Regional Manager in 2018 he was the Freshwater Ecology Group Manager in Christchurch.

Blue Maomao Arch, Poor Knights Marine Reserve.
(Crispin Middleton)

NIWA is New Zealand's leading natural resources and environmental science services provider.

Statement of
CORE PURPOSE OUTCOMES

Our purpose, set out in our Statement of Core Purpose, is to:

- enhance the economic value and sustainable management of New Zealand's aquatic resources and environments,
- provide understanding of climate and the atmosphere, and
- increase resilience to weather and climate hazards to improve the safety and wellbeing of New Zealanders.

We are expected to fulfil our purpose through the provision of research and transfer of technology and knowledge in partnership with key stakeholders, including industry, government and Māori, to achieve six key outcomes:

1. Increase economic growth through the sustainable management and use of aquatic resources.
2. Grow renewable energy production through developing a greater understanding of renewable aquatic and atmospheric energy resources.
3. Increase the resilience of New Zealand and southwest Pacific Islands to tsunami and weather and climate hazards, including drought, floods and sea-level change.
4. Enable New Zealand to adapt to the impacts and exploit the opportunities of climate variability and change and mitigate changes in atmospheric composition from greenhouse gases and air pollutants.
5. Enhance the stewardship of New Zealand's freshwater and marine ecosystems and biodiversity.
6. Increase understanding of the Antarctic and Southern Ocean climate, cryosphere, oceans and ecosystems and their longer-term impact on New Zealand.

The information in this section of the Annual Report demonstrates how NIWA is delivering on its expected outcomes.

NIWA's research and applied-science services are delivered through our science and sector-focused management units (see over page).

Each centre conducts a wide range of research aimed at enhancing the economic value and sustainable management of New Zealand's aquatic resources and environments, or improving our understanding of climate and the atmosphere and increasing our resilience to related hazards. Much of our work is directly applicable to a wide range of commercial operations.

Sector benefits from research and applied-science funded by MBIE Strategic Science Investment Funds are described in a separate report to MBIE and available on NIWA's website, "Benefits of MBIE Strategic Science Investment Funds".

NIWA'S NATIONAL SCIENCE CENTRES

National Centre for Climate and Atmosphere

Understanding the complex relationship between atmospheric composition and how our climate behaves, and is changing, has never been more important, as extreme weather events linked to climate change make their presence felt. NIWA has been designated by the Government as the lead CRI in research and services relating to the understanding of our climate and atmosphere.

Our work includes:

- quantifying the exchanges of greenhouse gases between atmosphere, ocean and biosphere
- quantifying the relationship between atmospheric composition and climate
- measuring agricultural greenhouse gas emissions
- observing, analysing and documenting the climate of New Zealand, the southwest Pacific, the Southern Ocean and Antarctica
- understanding climate processes and causes
- modelling future climate – from seasons to centuries ahead
- developing options for adapting to climate variability and change.

niwa.co.nz/our-science/climate
niwa.co.nz/our-science/atmosphere

National Natural Hazards Centre

New Zealanders need little reminding of how destructive nature can be. NIWA has been designated by the Government as the lead CRI in climate and weather hazards. We work closely with a number of other research agencies through the Natural Hazards Research Platform.

Our work includes:

- determining the frequency and magnitude of natural hazards
- estimating risk
- forecasting hazards by using integrated tools and modelling
- assembling research outcomes into meaningful and helpful outputs for end users.

niwa.co.nz/our-science/natural-hazards

National Centre for Coasts and Oceans

NIWA has been designated by the Government as the lead CRI in aquatic resources and environments (including coastal environments), aquatic biodiversity and biosecurity, and oceans – to provide the knowledge needed to support the sound management of our marine environments and resources. This ensures the vast economic, social and environmental benefits of our extensive marine estate can be realised.

Our work includes:

- oceanography, ocean geology, marine ecology, primary production and microbial processes
- undertaking environmental impact assessments
- determining rates of coastal erosion, and climate change impacts on the coast
- investigating impacts of coastal outfall and discharges
- habitat mapping and swath bathymetry of coastal environments.

niwa.co.nz/our-science/coasts-and-oceans

National Centre for Environmental Information

Data which are precise, reliable and consistently comparable are fundamental to every branch of NIWA's science, and vital to many other end users. The centre is recognised as leading environmental monitoring and observation, information management, and the delivery of high-quality, interoperable environmental data which can be used for many purposes.

Our work includes:

- monitoring the environment through our national observation services and networks
- managing the information we acquire
- delivering information in user-focused ways
- acquiring, storing and disseminating metadata – information about how, where, when and by whom environmental information has been collected.

niwa.co.nz/our-science/ei

National Aquaculture Centre

NIWA has been designated by the Government as the lead Crown Research Institute (CRI) in aquaculture. We focus on supporting the industry's growth targets, particularly through the development of new high-value species which can be farmed with a low environmental footprint.

Our work includes:

- developing high-performance aquaculture
- assessing and modelling the environmental effects of marine farm operations
- providing advice on designing and managing marine farms, and providing associated training
- conducting research into fish health
- providing breeding services
- conducting feed trials.

niwa.co.nz/our-science/aquaculture

National Fisheries Centre

Robust science is critical to the sustainable use of New Zealand's significant marine and freshwater fisheries. NIWA has been designated by the Government as the lead CRI in the delivery of research and services relating to freshwater and marine fisheries.

Our work includes:

- assessing fisheries resources within New Zealand's Exclusive Economic Zone
- monitoring and assessing international fisheries
- determining the environmental impact of fisheries.

niwa.co.nz/our-science/fisheries

National Centre for Freshwater and Estuaries

Meeting increasing and often competing demands for clean water is one of the biggest challenges facing the planet this century. NIWA has been designated by the Government as the lead CRI in aquatic resources and environments (with a focus on surface freshwaters), aquatic biodiversity and biosecurity, freshwater fisheries, and aquatic-based energy resources. We provide public information on river and lake conditions across New Zealand, including water quantity and quality. We also develop and distribute new water-related technology and management tools.

Our work includes:

- monitoring and providing advice on water quality
- catchment modelling
- assessing and managing flow
- advising on the management of freshwater species and habitats
- providing freshwater data online and specialist analytical services.

niwa.co.nz/our-science/freshwater

Te Kūwaha – National Centre for Māori Environmental Research

NIWA's goal is to share knowledge and empower Māori communities and businesses with leading-edge science. We undertake research and provide consultancy services across a number of core science areas, including aquaculture, freshwater, marine, natural hazards, climate and energy.

Our work includes:

- providing environmental research of benefit to Māori through the formation of strong and meaningful partnerships with iwi, hapū and Māori organisations
- collaborating with Māori, other research providers, and central and local government agencies to identify and respond to Māori research priorities
- developing a distinctive body of knowledge at the interface between indigenous knowledge and research, science and technology
- increasing our Māori research capacity and awareness within NIWA of tikanga and te reo Māori.

niwa.co.nz/our-science/te-kūwaha

Vessels

NIWA's vessels are world-class environmental monitoring and research platforms. They enable our marine scientists, specialists from partner research organisations and commercial clients to carry out work where the need for knowledge is greatest – no matter how remote or inhospitable the environment may be.

Tangaroa, our flagship deepwater research vessel, is ice-strengthened and New Zealand's only DP2-equipped vessel. DP2, an advanced dynamic positioning system, enables the vessel to remain stationary or follow a precise path even in strong winds and rough seas. *Tangaroa* is also equipped with a range of sophisticated equipment enabling us to explore from sea surface to seabed and expand our understanding of our unique marine environment and its resources.
A wide range of inshore and coastal research is made possible by *Kaharoa* and *Ikatere* – as well as a fleet of smaller inshore boats – to assist in coastal resource management.

niwa.co.nz/our-science/vessels

Pacific Rim

NIWA has a long history of providing applied science and environmental consultancy services to support international development activities, with a particular focus on the Pacific and Asia regions.

Our expertise and capabilities cover a wide range of applied science-based assistance to support the sustainable management of marine and freshwater resources and environments, increasing community and economic resilience to natural hazards, and understanding and adapting to the impacts of climate extremes, variability and change.

niwa.co.nz/our-science/pacific-rim

Increase economic growth through the sustainable management and use of aquatic resources

Right water at the right time

Ten Canterbury farms are currently piloting a unique package of soil-moisture data and farm-specific weather forecasts to boost production and save on water usage and irrigation-related costs.

The project flows directly from an innovative NIWA-led programme to promote the sharing of research techniques that benefit both the environment and farming bottom lines.

Although irrigation is costly, a lack of access to reliable information and detailed forecasts can see irrigation scheduled just ahead of heavy rainfall events. Not only is precious water wasted, but valuable nutrients leach from the soil, with negative effects on both farm profits and the environment.

NIWA began working with farmers in the Waimakariri catchment in 2012 to develop better ways to manage irrigation through its Water Use Efficiency programme.

Farmers were supplied with daily updates on soil moisture, temperature and evapotranspiration rates, along with detailed farm-specific weather forecasts, to inform water management and when best to apply nutrients.

The success of the programme in ensuring that water is delivered to the right places in the right quantities was recognised with its extension to 10 more Canterbury farms through a new five-year MBIE Endeavour project supported by Environment Canterbury, DairyNZ, Fonterra, AgResearch and IrrigationNZ.

Improving Pacific Island fisheries

A shark tagging programme led by NIWA is providing valuable information about the fate of mako and silky sharks caught by commercial tuna longlines in the Western Pacific, aiding management of both sharks and tuna.

Experts from NIWA, contracted by the Western and Central Pacific Fisheries Commission, have trained fisheries observers in New Zealand, Fiji, and the Marshall Islands how to tag the sharks. Colleagues at The Pacific Community (SPC) in Noumea have trained New Caledonian observers to do the same.

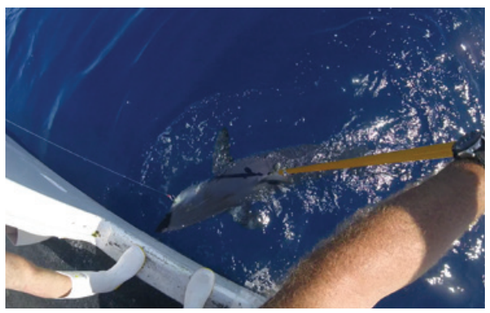
The aim is to determine whether the sharks survive capture and release from the longlines of commercial tuna fishing vessels.

Sharks that are released alive from a longline may die shortly afterwards from the trauma or stress of being caught and released, but they are not counted as catch. Until recently, there was no information on what proportion of the discarded sharks survived, making it impossible to determine the total mortality caused by fishing.

Observer tagging is changing all that. Pop-up electronic tags that record daily depth and water temperature are attached to live sharks taken as bycatch. The tags are used to determine a shark's fate by monitoring its movement patterns.

Living sharks move up and down the water column. Dead sharks on the other hand will sink to the bottom. After two days of no vertical movement, a tag will detach, float to the surface, and transmit information to satellites, indicating a dead shark. After 60 days of movement, a tag will also detach, indicating a living shark.

Left
Tagging mako sharks.
(MPI)



Taking stock of a delicacy

New Zealand scampi are small lobsters which are prized by chefs around the world and attract a premium on the international seafood market. The scampi export market is worth up to $50 million annually, with Seafood New Zealand reporting an average export price of $40.60 per kilogram in 2017.

Scampi are one of the 100+ species on which we provide scientific advice to Fisheries New Zealand.

Scampi live in burrows on the sea floor in waters 300–550m deep around New Zealand. They are fished using light trawl gear, which catches animals that have emerged from their burrows.

NIWA researchers have been carrying out scampi abundance surveys and assessments since 1998, 10 years after the lobsters were first fished commercially. The surveys are done on NIWA research vessel *Kaharoa*, with cameras, first film and now digital, taking thousands of pictures of scampi seabed habitat. These are used to provide estimates of burrow abundance and scampi abundance – those that are visible on the sea floor.

NIWA has conducted photographic time series surveys in the four major scampi fisheries, and these provide critical information to assist with fisheries management. The most recently completed photographic survey estimate was carried out on Mernoo Bank in September/October 2016. It added to the trend in increasing abundance observed since 2009 on the Chatham Rise. Trawl survey catch rates also increased, continuing the overall trend since the 2009 survey. But both burrow abundance and trawl survey biomass estimates for the area consistently surveyed remained well below survey estimates from 2001.

Abundance assessments such as these are used to inform decisions on increases or decreases to total allowable catch (TAC), and Fisheries New Zealand are consulting on a change to the TAC for this stock, on the basis of the survey and subsequent stock assessment.

Economic impact of marine invaders

A study by NIWA estimates that the Greenshell™ mussel industry could be impacted to the tune of $24.6 million over 24 years if the spread of Mediterranean fan worms and clubbed tunicates is left unchecked.

The study sounds an alarm bell that intervention against aquatic marine pests like these is necessary and justified. Its conclusions were significant enough to warrant publication in an international aquaculture journal.

Fan worms and clubbed tunicates are an emerging problem in New Zealand. They have gained a foothold on some Coromandel mussel farms, but haven't yet spread to South Island marine farms.

Protecting New Zealand's aquaculture industry is paramount – unwanted marine pests and diseases can ruin production systems, compete with native species and alter important ecosystem services.

Fan worms and clubbed tunicates are biofouling organisms, and both feed on planktonic creatures. They form dense canopies, and can quickly crowd out the competition and extract food before it gets to mussels or other farmed species.

Predicting the economic impact on mussels involved some complex modelling and analysis. Models of infection spread and energy flow on mussel farms were put together, and the reduced growth and production of farmed mussels was converted into lost economic value.

The study notes that slowing spread and reducing densities could significantly mitigate the potential impacts.

Studies like these inform regional councils and MPI .who are trying to remove fan worms from areas they have recently been detected.

Middle
Scampi at burrow.
(NIWA)

Right
Biosecurity surveying.
(Peter Marriott)

Grow renewable energy production through developing a greater understanding of renewable aquatic and atmospheric energy resources

Weed-free water for hydro generation

Aquatic weeds can result in New Zealand losing important renewable electricity generation potential from its hydro-electricity generation and cause hydro-electricity generators millions of dollars of losses when they restrict or block intake screens or cooling intakes.

To minimise this, generators such as Meridian Energy are funding systematic searches for early weed detection and control works to contain or reduce water weeds.

NIWA researchers are assisting by identifying high risk sites, applying best practice surveillance and informing weed control operations and assessing outcomes.

For example, in 2014 Meridian Energy developed an aquatic weed management strategy for the Waitaki catchment, which included a goal of targeted surveillance to ensure early detection of weeds when their containment and removal was still possible. Meridian commissioned NIWA to develop a surveillance plan which uses our scientific understanding to identify key sites with the greatest risk of weed introduction. These include popular access places such as ramps and jetties in lakes, and the hydro canals where the weeds have not yet established. We also recommend the best methods of weed detection and frequency of checks. The plan is updated whenever there are substantial changes in risk such as the development of new access points. Meridian, Genesis and ECan jointly fund the implementation of this surveillance plan.

NIWA also provides expertise to weed programmes run by LINZ and multi-agency groups, including hydro-generation companies, such as the Lake Dunstan Aquatic Weed Management Group (Contact Energy), Karāpiro Aquatic Weed Management Group (Mercury) and Lake Benmore management programme (LINZ and Meridian Energy).

The jointly-funded LINZ and Meridian Energy Lake Benmore annual control works programme is designed to control lagarosiphon infestation, with the weed first recorded in an upper arm in 2003. These control works have substantially slowed the establishment and spread of lagarosiphon downstream towards Benmore Power Station.

Top
Aleki Taumoepeau with lagarosiphon removed from Lake Aviemore.
(Susie Elcock)

We have the power

As the world looks beyond fossil fuels, NIWA research is developing new tools to help New Zealand make the transition to clean renewable energy.

New Zealand depends heavily on fossil fuels for transport and industry, but more than 80 per cent of its electricity comes from renewable sources: hydroelectricity, geothermal, and wind. Less than 0.2 per cent is currently solar, but by 2050 it is likely to be the largest source. To meet the Government's Zero Carbon target, electricity generation from renewables will need to more than double to replace energy from fossil fuels.

There is significant potential in solar generation. Germany has four times New Zealand's total generating capacity from solar alone, yet our research shows that New Zealand receives a lot more solar energy than Germany, and photovoltaic solar panels have fallen dramatically in price over the last decade. In addition, solar generation is now second only to wind in cost-effectiveness over the lifetime of a system, and it doesn't need resource consent or a multi-million dollar investment.

SolarView, a free web-based tool designed by NIWA, helps homeowners work out whether solar power is a viable option for their energy needs. They can now assess the solar potential of their roof, or walls, with solar data from the nearest climate station. The software corrects for the terrain around their homes, and it shows how to adjust for obstructions such as trees or houses.

NIWA tools, used by more than 60 companies in New Zealand, also provide the information needed by installers to optimise a home system.

Top
Solar panels.
(iStock)

Increase the resilience of New Zealand and southwest Pacific Islands to tsunami and weather and climate hazards, including drought, floods and sea-level change

Increasing drought resilience in the Marshall Islands

NIWA scientists have released a new water risk assessment model for Pacific atoll countries. Incorporated as a module in RiskScape – a tool which estimates impacts and losses from natural hazards – it will help atoll countries better prepare for water shortages and drought.

Pacific atoll nations face uncertainty in planning for, declaring, and responding to severe drought conditions, such as those which occurred in the Republic of the Marshall Islands (RMI) and other Pacific Island nations during the 2015–16 El Niño event. The Republic of the Marshall Islands depends on rainfall for more than 90 per cent of its water supplies, but it received only one-quarter of its usual rainfall during this event, resulting in the declaration of a state of emergency.

The innovative approach we adopted was co-developed with the RMI government and local NGOs from January to June 2018, focusing on three atolls. The completed module was presented to the RMI government, and, after positive feedback, they asked us to help them extend the tool to include another nine atolls.

The project will allow the Marshallese to plan, target and respond to atolls with the most pressing water shortages, and other Pacific countries have now expressed an interest in the model.

This new water risk assessment module is part of PARTneR (Pacific Risk Tool for Resilience), an MFAT-funded project which tailors RiskScape to predict, plan and prepare for the harm caused by disasters in the Pacific.

Top
Marshall Islands.
(Thomas Reiss, USGS)

Measuring an earthquake's undersea impact

The first global example of the impact of undersea canyon flushing following a major earthquake has been published by NIWA marine geologists.

Using bathymetry data collected before and after the 2016 Kaikōura earthquake, our scientists were able to show the scale of the landslides that occurred immediately after the quake and reveal a primary process in submarine canyon formation.

Writing in the prestigious journal *Science Advances*, they calculated at least 850 million tonnes of sediment was dislodged from the head of the canyon immediately after the earthquake. Mud was stripped from almost every part of the upper slopes and flushed through the canyon's central channel, wiping out all organisms living in the seabed. It then travelled along the deepsea Hikurangi Channel and its banks, up to 680km northeast of Kaikōura.

The event also changed much of the canyon floor, deepening the upper canyon by 50–60m, eroding into rock in the middle canyon, and moving dunes of gravel through the lower canyon. The study unequivocally demonstrated that earthquake-triggered canyon flushing is the primary process that carves out submarine canyons and delivers coastal sediment to the deep ocean.

The material removed included seven million tonnes of carbon now available to nourish deepsea communities. The event also had a major impact on the benthic ecosystem, indicating the importance of seafloor disturbance to marine ecology. Similar events are calculated to occur every 140 years, and this now offers an exceptional opportunity to understand the functioning and importance of submarine canyons in nearshore ecosystems and long-term sediment transfer across continental margins.

Top
Debris on the Kaikōura Canyon floor after the 2016 earthquake.
(NIWA)

Enable New Zealand to adapt to the impacts and exploit the opportunities of climate variability and change and mitigate changes in atmospheric composition from greenhouse gases and air pollutants

Guiding government on rising seas

In December, Principal Scientist Dr Rob Bell was alongside Climate Change Minister James Shaw at the public release of a long-awaited coastal guidance to help councils and communities manage and adapt to the increased risks posed by climate change and rising sea level.

Writing the updated Ministry for the Environment Coastal Hazards and Climate Change Guidance for Local Government was led by NIWA, with authors from Victoria University of Wellington and a consultant planner.

The guidance updates the previous version which was a decade old. This time it includes expanded content on approaches that address uncertainty head on, providing helpful guidance to practitioners working on long-term planning or infrastructure projects at the coast and around estuaries.

It differs in approach from earlier documents by incorporating uncertainty into hazard and risk assessments and planning for adaptation, using four scenarios for sea-level rise into the future. These range from half a metre to 1.4 metres by 2120, depending on how global emissions track over this time.

Adopting what is known as a dynamic adaptive pathways planning approach will enable councils and communities collaboratively to develop pathways comprising short-term actions and long-term options that can be implemented for coastal areas at risk when an agreed trigger is reached (e.g., after a number of flood events). A 10-step decision-making process is outlined for councils and communities to follow and is specifically designed for use when there is uncertainty about future physical, social, cultural and environmental impacts on low-lying coastal areas.

The NIWA authors are part of the Ministry for the Environment team conducting a nationwide series of workshops and seminars for council staff, councillors, engineers, planners and infrastructure operators to encourage them to start planning now rather than wait for more certainty about the future rate of change.

Top
A king tide and large waves wreak havoc along Auckland's Tamaki Drive.
(Stuart Mackay)

Bottom left
Taylor Glacier, Antarctica.
(Katja Riedel)

Bottom right
NIWA technicians and villagers install a water level gauge alongside Yalu River, Papua New Guinea.
(Jeremy Rutherford)

Measuring methane in ancient Antarctic bubbles

NIWA, as part of an international team, analysed air bubbles in ice for a piece of complex science that could alter how countries fight global warming.

The scientists were seeking to find out how much fossil methane escapes naturally from oil and gas fields and how much is due to industrial activity. They also investigated how much stored methane was released into the atmosphere during rapid warming that ended the last ice age.

The extremely challenging work required the extraction of air more than 10,000-years-old from tiny bubbles trapped in layers of Antarctic ice. Just to produce 100 litres of ancient air a single measurement required processing one tonne of 11,000-year-old ice from the Taylor Glacier in Antarctica, while maintaining purity levels necessary for trace-level analysis.

NIWA expertise was used to isolate the pure methane from the air sample. That was then sent to a specialised laboratory in Australia for radiocarbon dating.

The findings show no massive release of stored methane, such as from permafrost, when the Earth warmed 11,000 years ago, suggesting a future release under global warming is less likely than has been suggested.

The results further reveal which human sources are responsible for increasing levels of methane. The team found that natural seepage from oil and gas fields is a fraction of previous estimates, indicating that methane emissions from industrial fossil fuel use and extraction are far greater than realised and have been underestimated by about one-half.

The research shows the important of targeting both fossil fuel and agricultural methane emissions to reduce global warming.

Early warning in Papua New Guinea

Papua New Guinea's Bumbu River has a long history of disaster.

At about 30km long it may be short by New Zealand standards, but it cuts through the country's second biggest city of Lae and has more than 5,000 people living on its banks – many of whom have migrated to the city and are living in informal settlements.

The river is prone to flooding in the rainy season and the damage can be catastrophic.

This year, NIWA completed a project that aims to help build community resilience against flooding and improve Papua New Guinea's disaster preparedness in the face of increasing climate-related disasters.

Contracted by the United Nations Development Programme (UNDP), and in collaboration with the Papua New Guinea National Weather Service, Conservation and Environment Protection Authority, Climate Change Development Authority, National Disaster Centre and Morobe Provincial Disaster Centre, NIWA and PNG staff installed an early warning system for floods in a pilot scheme for the river that comprises three river water-level stations on the Bumbu and automatic weather stations in five provinces.

It was a challenging project for NIWA's technical team. Sites had to be selected according to ease of access, while some of the main river channels changed too often for them to be reliably monitored.

Once the equipment was installed, standard operating procedures were developed and tested during a simulation exercise held to ensure key agencies could provide, disseminate and respond to a flood warning.

The Papua New Guinea government sees the pilot flood early warning system as a major milestone for the country that will hopefully be replicated for other major rivers.

The data produced by the river monitoring sites will also be invaluable for other development planning for Morobe Province because it has been 22 years since the last collection of hydrological data.

Enhance the stewardship of New Zealand's freshwater and marine ecosystems and biodiversity

Ngā Repo o Maniapoto

For many whānau and hapū repo (wetlands) and puna (springs) are a highly valued traditional resource and an integral component of their ancestral landscape. In Waikato only 10 per cent of wetlands remain, and their loss, and the associated loss of resources and knowledge, is an important issue for Ngāti Maniapoto.

The Te Kūwaha team, NIWA's National Centre for Māori Environmental Research, worked with Ngāti Maniapoto to develop an inventory of wetlands and a decision-support framework to prioritise wetland restoration efforts based on mātauranga-a-hapū, which included understanding their values, the cultural significance, the uses and the resources associated with each repo.

Kaumātua and key knowledge holders were interviewed about the location, size and significance of existing repo and puna, as well as the desire for restoration to occur.

The decision-support framework was developed through two wānanga, where whānau explored what made the site important to them and how they make decisions. Using this information, a matrix was developed to provide a logical structure for prioritising future restoration action.

A total of 185 puna and repo sites were mapped and 17 were identified as priority one sites for restoration.

Ngā Repo o Maniapoto was a collaboration between NIWA, The Maniapoto Māori Trust Board Whanake Taiao team, and the Hauauru ki Uta and Nehenehenui Regional Management Committees.

Defining swimmability

The quality of New Zealand's freshwater, and in particular the 'swimmability' of rivers, is a politically charged issue. The National Policy Statement for Freshwater Management (NPS-FM) was amended in 2017 to cover swimmability, and it uses concentrations of *Escherichia coli* (*E. coli*) as a key attribute for this value.

In March 2018 we completed a report for the Ministry for the Environment (MfE) on national *E. coli* modelling carried out last year by NIWA researchers. The report was an appendix to MfE's own report that provides regions with information needed to set *E. coli* targets for swimmable lakes and rivers, which had been added to the NPS-FM in 2017.

The report described the *E. coli* model, including its calibration and limitations, and gave an overview of the input data, including point sources and policy information provided by regional councils. It modelled the effects of national and regional mitigation measures, that are either already in place or have been proposed, to improve water quality in terms of the annual loads and concentrations of *E. coli* and associated faecal residues in rivers.

NIWA's international reputation in 'swimmable' research is such that last year the US Environmental Protection Agency contracted us to review recent literature relating to swimmability. The US EPA is required to review its 2012 'Recreational Water Quality Criteria' every five years, and wanted to take advantage of NIWA's expertise. This review has recently been published in full, as part of a major report by the agency, which concluded that the 2012 criteria need not be altered for now. The publication includes recognition of recent swimmability research in New Zealand.

Migratory fish get helping hand

Humans don't always make it easy for fish to get where they need to go. New Zealand's first national set of Fish Passage Guidelines – co-developed by NIWA – is expected to help.

Migratory species such as giant kōkopu and longfin eels need to migrate to access different habitats for feeding, reproduction and to complete their life cycles, but they are threatened by barriers like dams, weirs and culverts. These barriers can disrupt the natural flow of rivers and impede fish migration.

The biodiversity benefits of fish-friendly stream structures are manifold. Many of our migratory native fish are threatened and they are a crucial link in the food chain and play an important role in healthy and productive river systems.

The guidelines were a collaborative effort between NIWA and the Department of Conservation, overseen by a multi-stakeholder Fish Passage Advisory Group.

The guidelines were developed to help infrastructure designers and managers, waterway managers, environmental officers, iwi and local communities understand fish passage requirements and promote better management. They set out recommended practice for designing in-stream structures under 4m high and mitigating existing barriers to passage, and they have been used by several regional councils and consultants since their launch in April 2018.

They are also likely to help preserve the culturally important practice of whitebaiting.

Revitalising the "milk of our ancestors"

Lake Tūtira in Hawke's Bay is central to the lives of the Maungaharuru-Tangitū hapū.

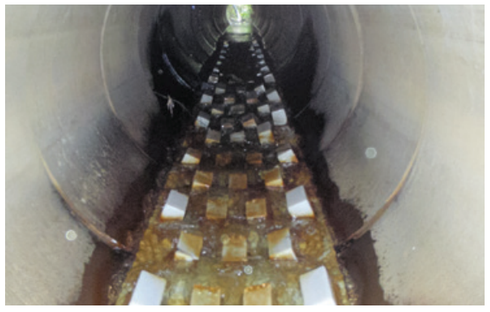
In the past the lake has provided water, sustenance and medicinal plants, as well as a place to live and learn. The hapū's deep spiritual connection is reflected by their reference to the lake as "ko te waiū o ō tātau tīpuna – the milk of our ancestors."

But Tūtira has suffered decades of pastoral run-off and pollution which has led in recent years to severe algal blooms and occasional closures.

NIWA's Te Kūwaha Māori Environmental Research team and Tipa and Associates have worked with hapū members and the Maungaharuru-Tangitū Trust (MTT) to bring together whānau knowledge and outline a hapū-led restoration and rehabilitation plan. It is part of Te Kūwaha's on-going work engaging with hapū and iwi to co-deliver research that meets their needs.

A report has been completed, summarising the actions that MTT and agencies could implement to restore and protect the Tūtira catchment. MTT will use this report to develop their own Environmental Action Plan and to help steer further restoration projects through the Freshwater Improvement Fund's 'Te Waiū o Tūtira' project.

This involves a commitment of more than $1.5 million over four years and aims to develop farm environmental management programmes throughout the catchment, reconnect Papakiri Stream to Lake Tūtira, install an oxygenation system and implement a mauri monitoring programme.



Far left
Ngā Tai o Kāwhia participants and Maniapoto Māori Trust Board staff.
(Ngahuia Herangi)

Middle
Blue Lake, St Bathans.
(Michael Kotcamp)

Right
Fish passage baffles installed in a culvert.
(Paul Franklin)

Increase understanding of the Antarctic and Southern Ocean climate, cryosphere, oceans and ecosystems and their longer-term impact on New Zealand

Modelling sea ice

Sea ice is one of the most visible signs of climate change, but scientists often struggle to simulate realistic sea ice cover.

NIWA scientists have developed an innovative approach to improve understanding of how sea ice grows and melts each year. A new model can separate the different sizes of floe, telling us more about the growth and melt processes that occur for different sea ice types.

Sea ice made up of small round floes known as pancakes is already common in the Antarctic and is becoming more common in the Arctic. Pancake sea ice is created when ice forms in rough seas, with the waves causing small pieces of ice to knock against each other and rounding their edges.

Pancake sea ice is too small to observe by satellite, and the polar regions in autumn and winter are inhospitable for both humans and scientific equipment. This means that observations of how pancake floes grow and freeze together have never been made before.

In a novel approach, NIWA scientists have used drifting wave buoys equipped with cameras to provide the first-ever measurements of pancake freezing processes.

This ground-breaking research is already helping the next generation of sea ice models tell us how important the physical processes that occur on the scale of centimetres are for prediction of the polar climate system.

Top
Researchers observing pancake ice in the Southern Ocean.
(Dave Allen)

Middle
An instrument is lowered down a hole drilled through ice in Antarctica.
(Craig Stevens)

Far right
Iceberg alert – the first one spotted as *Tangaora* ventures south.
(David Bowden)

Unlocking climate secrets under the ice

Antarctica's Ross Ice Shelf is the world's largest floating slab of ice: it's about the size of Spain, and nearly a kilometre thick.

The ocean beneath is roughly the volume of the North Sea and its impact on the ice shelf above is one of the most important, but least understood, parts of the climate system.

Over the summer season, NIWA scientists joined colleagues on the ice in the multi-disciplinary Aotearoa New Zealand Ross Ice Shelf programme.

Drilling specialists from Victoria University of Wellington successfully melted a hole through the ice, enabling us to sample the water below and investigate the shelf's vulnerability to climate change.

This is only the second time since the 1970s that measurements have been taken from the ocean's central region, and the comparison shows the waters are both warming and freshening.

The drilling also revealed that the underside of the ice is covered with what appears to be newly formed, temporary ice crystals.

These results are significant because up until now the impact of warm, fresher water below, the cold surface currents above and the effect ice crystals play in heat transfer to the ice shelf itself have not been factored into climate models.

It is still not clear exactly how these hidden waters interact with the world's oceans, but the ability to integrate these results with computer simulations enables climate scientists to better model the dynamics of the ice shelf itself.

Sailing to Antarctica to study climate change and more

NIWA's deepwater research vessel *Tangaroa* sailed south in February 2018 for a six-week voyage to Antarctica, where scientists studied ocean, atmosphere, and ecosystem processes in the Ross Sea and Southern Ocean.

Long-term experiments were installed and a wide range of samples and data were collected to help improve understanding of climate and oceanographic processes in the region, and how these influence the marine ecosystem.

The objectives were a better understanding of climate change effects, marine microbial community structure and function, the influence of marine aerosols on cloud formation and the abundance, diversity and distribution of seabed habitats and fauna, mesopelagic fish, krill and zooplankton.

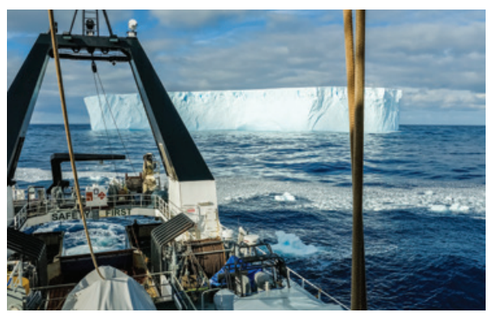
One of the key aims of the multi-disciplinary voyage was to generate baseline data required to determine whether the objectives of the Ross Sea Marine Protected Area (which came into existence in December 2017) are being achieved.

The absence of sea ice in the Ross Sea during the voyage surprised scientists onboard, but also enabled them to get to places they had originally thought inaccessible. Some of the data collected will be valuable in helping to determine the effects a lack of sea ice has on the Antarctic ecosystem.

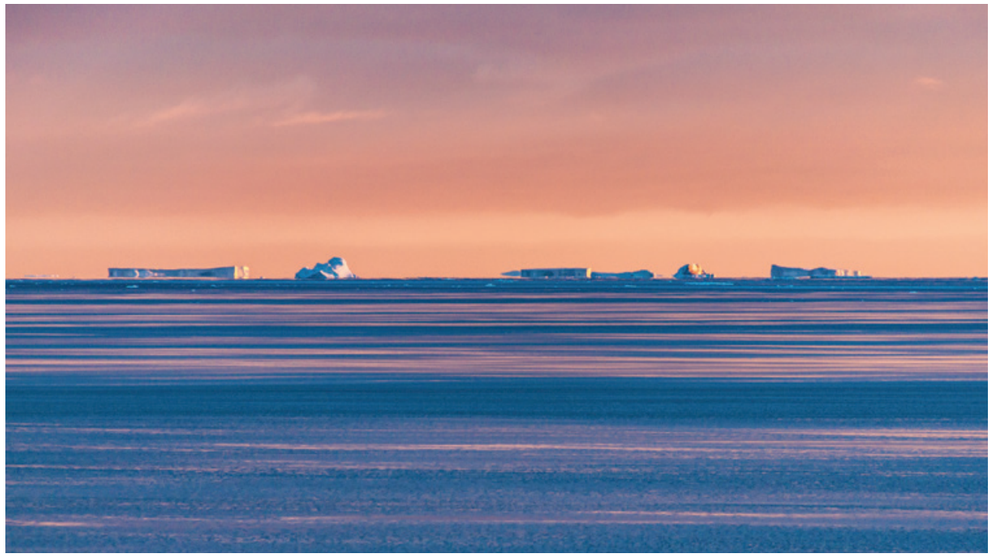
A study known as the Ross Outflow Experiment was established off Cape Adare to provide important information about long-term changes in the amount of extremely cold, dense water that flows out from the Ross Sea and influences the global circulation of the oceans.

The work will also contribute to refining earth system models to predict future change.

Tangaroa will return to Antarctica early in 2019 to carry out further research and pick up seven instrument moorings deployed on this voyage.



NATIONAL SCIENCE CHALLENGES



Collaborating for New Zealand's benefit

The National Science Challenges are cross-disciplinary, mission-led programmes designed to tackle New Zealand's biggest science-based challenges. They require collaboration between researchers from Crown Research Institutes, universities and other institutions, businesses and non-government organisations.

NIWA is involved in 6 of the 11 challenges, with our researchers leading many significant projects.

We host two challenges – *Deep South* and *Sustainable Seas*.

***Deep South* is focused on helping New Zealanders anticipate, adapt, manage risk and thrive in a changing climate.**

This year NIWA's Antarctic voyage provided unique opportunities to take observations in the Southern Ocean and its overlying atmosphere. The data collected will improve the New Zealand earth system model, which is central to the Challenge's broad effort to refine climate predictions for New Zealand.

***Sustainable Seas* has the vision of healthy marine ecosystems providing value for every New Zealander.**

It has 40 projects under way, 14 led by NIWA. In 2017/18 the challenge developed tools to support ecosystem-based management, an all-encompassing approach to managing competing uses and demands on marine resources.

NIWA also leads two of the largest programmes in the *Our Land and Water* challenge. The first identifies the risks of generating unacceptable environmental pressures from particular land uses, such as nutrient leaching, in a range of landscapes. The second looks at land-use effects on economic, environmental, social and cultural values at whole-catchment scale.

Our major project for *New Zealand's Biological Heritage* challenge is an investigation into what's in our groundwater. NIWA is also looking at tangible solutions to support communities in vulnerable coastal areas as part of the *Resilience to Nature's Challenges* initiative. And we are contributing to research outcomes for the *Building Better Homes, Towns and Cities* challenge.

Top
Sunset, Terra Nova Bay, Antarctica.
(Dave Allen)

PERFORMANCE TARGETS 2017/18

NIWA will measure its performance against the outcomes and operating principles in its Statement of Core Purpose using the following set of indicators.

Financial Indicators

Measure	Calculation	Reporting frequency	Target 2017/18	Actual 2018/18
Operating margin	Earnings Before Interest, Tax, Depreciation, Amortisation and Fair-value (EBITDAF)/Revenue	Annually	15.8%	15.6%
Profit per FTE	EBITDAF/FTE	Annually	$36,000	$37,000
Quick ratio	Current assets less inventory less prepayments/ Current liabilities less revenue received in advance	Quarterly	2.00	2.00
Interest coverage	EBITDAF/Interest paid	Quarterly	Not applicable	Not applicable
Profit volatility	Standard deviation of EBITDAF for past five years/ Average EBITDAF for the past five years	Annually	6.9%	7.2%
Forecasting risk	Five-year average of return on equity less forecast return on equity	Annually	1.1%	1.2%
Adjusted return on equity	NPAT excluding fair value movements (net of tax)/ Average of share capital plus retained earnings	Quarterly	6.2%	6.9%
Revenue growth	% change in revenue	Annually	5.9%	6.2%
Capital renewal	Capital expenditure/Depreciation expense plus amortisation expense	Quarterly	209.6%	214.4%

Organisational Performance Indicators – 2017/18 at a glance

Measure	Calculation	Reporting frequency	Target 2017/18	Actual 2017/18
End-user collaboration*	Revenue per FTE from commercial sources	Quarterly	$91,000	$89,800
Research collaboration*	Publications with collaborators	Quarterly	75%	90%
Technology & knowledge transfer*	Commercial reports per scientist FTE	Quarterly	1.0	1.1
Science quality*	Impact of scientific publications	Annually	2.5	3.5
Operational efficiency*	Revenue per FTE	Quarterly	$229,000	$237,700
Operational delivery	% projects delivered on time	Annually	>90%	94.8%
Strategic progress – operations	% Enabling Plan KPIs in Section 3 achieved	Annually	>90%	>93%
Strategic progress – science	% Science Plan KPIs in Section 2 achieved	Annually	>90%	>92%
Stakeholder engagement*	% stakeholders confident in NIWA's priority setting process	Biennially	>70%	>53%
Stakeholder engagement*	% collaborators confident in NIWA's ability to take a best team approach	Biennially	>90%	>78%
Stakeholder engagement*	% end users who have adopted knowledge or technology developed by NIWA	Biennially	>90%	>88%

*Ministry of Business, Innovation & Employment generic indicators.

Aoraki Mt Cook.
(Dave Allen)

FINANCIAL STATEMENTS

NIWA GROUP
STATEMENT OF COMPREHENSIVE INCOME

For the year ended 30 June 2018

in thousands of New Zealand dollars	Notes	2018 Actual	2018 SCI Budget (unaudited)	2017 Actual
Revenue and other gains	1			
Revenue		151,415	148,670	142,617
Other gains		1	–	1
Total income		**151,416**	**148,670**	**142,618**
Operating expenses	2			
Employee benefits expense		(70,079)	(69,867)	(65,766)
Other expenses		(57,669)	(55,373)	(56,020)
		(127,748)	**(125,240)**	**(121,786)**
Profit before interest, income tax, depreciation, and amortisation		**23,668**	**23,430**	**20,832**
Depreciation	4	(14,448)	(16,037)	(14,775)
Amortisation	6	(1,036)	(668)	(978)
Profit before interest and income tax		**8,184**	**6,725**	**5,079**
Interest income		890	1,347	871
Finance expense		–	–	–
Net interest and other financing income		**890**	**1,347**	**871**
Profit before income tax		**9,074**	**8,072**	**5,950**
Income tax expense	10	(2,602)	(2,263)	(1,700)
Profit for the year		**6,472**	**5,809**	**4,250**
Other comprehensive income (loss)				
Items that may be reclassified to profit or loss				
Foreign currency translation differences of foreign operations		39	–	(17)
Total comprehensive income for the year		**6,511**	**5,809**	**4,233**
Profit attributable to:				
Owners of the Parent		6,451	5,834	4,231
Non-controlling interest		21	(25)	19
Profit for the year		**6,472**	**5,809**	**4,250**
Total comprehensive income attributable to:				
Owners of the Parent		6,490	5,834	4,214
Non-controlling interest		21	(25)	19
Total comprehensive income for the year		**6,511**	**5,809**	**4,233**

The accompanying 'Notes to the financial statements' are an integral part of, and should be read in conjunction with, these financial statements.

NIWA GROUP
STATEMENT OF CHANGES IN EQUITY

For the year ended 30 June 2018

in thousands of New Zealand dollars	Share capital	Retained earnings	Non-controlling interest	Foreign currency translation reserve	Total equity
Balance at 1 July 2016	**24,799**	**84,582**	**216**	**(260)**	**109,337**
Profit for the year	–	4,231	19	–	4,250
Other comprehensive income	–	–	–	(17)	(17)
Total comprehensive income	–	4,231	19	(17)	4,233
Balance at 30 June 2017	**24,799**	**88,813**	**235**	**(277)**	**113,570**
Balance at 1 July 2017	**24,799**	**88,813**	**235**	**(277)**	**113,570**
Profit for the year	–	6,451	21	–	6,472
Other comprehensive income	–	–	–	39	39
Total comprehensive income	–	6,451	21	39	6,511
Balance at 30 June 2018	**24,799**	**95,264**	**256**	**(238)**	**120,081**

The accompanying 'Notes to the financial statements' are an integral part of, and should be read in conjunction with, these financial statements.

Share capital

The Group has authorised issued and fully paid capital of 24,798,700 ordinary shares (2017: 24,798,700 ordinary shares). All shares carry equal voting and distribution rights and have no par value.

NIWA GROUP
STATEMENT OF FINANCIAL POSITION

As at 30 June 2018

in thousands of New Zealand dollars	Notes	2018 Actual	2018 SCI Budget (unaudited)	2017 Actual
Equity and liabilities				
Equity				
Share capital		24,799	24,799	24,799
Equity reserves		95,026	94,183	88,536
Shareholders' interest		**119,825**	**118,982**	**113,335**
Non-controlling interest		256	248	235
Total equity		**120,081**	**119,230**	**113,570**
Non-current liabilities				
Provision for employee entitlements	3	872	1,034	809
Term loan		–	3,000	–
Deferred tax liability	11	5,908	7,049	7,244
Total non-current liabilities		**6,780**	**11,083**	**8,053**
Current liabilities				
Payables and accruals		12,222	12,681	11,375
Revenue in advance		14,668	11,546	14,561
Provision for employee entitlements	3	8,168	7,687	8,044
Taxation payable		2,887	–	350
Forward exchange derivatives		1	3	17
Total current liabilities		**37,946**	**31,917**	**34,347**
Total equity and liabilities		**164,807**	**162,230**	**155,970**
Assets				
Non-current assets				
Property, plant, and equipment	4	112,892	117,207	95,177
Identifiable intangibles	6	1,868	–	1,925
Deferred tax asset	11	178	–	160
Prepayments		51	–	5
Total non-current assets		**114,989**	**117,207**	**97,267**
Current assets				
Cash and cash equivalents	12	16,839	21,182	7,429
Other short-term investments	12	5,000	–	25,000
Receivables	8	17,843	13,804	13,967
Prepayments		2,431	2,224	2,231
Assets held for sale	7	188	–	–
Uninvoiced receivables		5,043	5,679	7,920
Inventory	9	2,474	2,134	2,156
Total current assets		**49,818**	**45,023**	**58,703**
Total assets		**164,807**	**162,230**	**155,970**

The accompanying 'Notes to the financial statements' are an integral part of, and should be read in conjunction with, these financial statements.

For and on behalf of the Board:

Barry Harris
Chairman

Nicholas Main
Deputy Chairman

The financial statements were authorised for issue by the directors on 17 August 2018

NIWA GROUP CASH FLOW STATEMENT

For the year ended 30 June 2018

in thousands of New Zealand dollars	Notes	2018 Actual	2018 SCI Budget (unaudited)	2017 Actual
Cash flows from operating activities				
Cash was provided from:				
Receipts from customers		150,511	145,509	147,675
Dividends received		1	–	1
Interest received		890	1,347	871
Cash was disbursed to:				
Payments to employees and suppliers		(127,290)	(126,390)	(121,731)
Interest paid		–	–	–
Taxation paid		(1,418)	(2,015)	(1,860)
Net cash inflow from operating activities	**12**	**22,694**	**18,451**	**24,956**
Cash flows from investing activities				
Cash was provided from:				
Sale of property, plant, and equipment		162	–	146
Term deposits maturing		24,000	–	22,000
Cash was applied to:				
Purchase of property, plant, and equipment		(32,479)	(34,342)	(11,311)
Purchase of intangible assets		(979)	(668)	(1,688)
Investments in other term deposits		(4,000)	–	(47,000)
Net cash (outflow) from investing activities		**(13,296)**	**(35,010)**	**(37,853)**
Cash flows from financing activities				
Cash was provided from:				
Term borrowings		–	3,000	–
Net cash inflow from financing activities		**–**	**3,000**	**–**
Increase (decrease) in cash and cash equivalents		**9,398**	**(13,559)**	**(12,897)**
Effects of exchange rate changes on the balance of cash held in foreign currency		12	–	(2)
Opening balance of cash and cash equivalents		7,429	34,741	20,328
Closing cash and cash equivalents balance		**16,839**	**21,182**	**7,429**
Made up of:				
Cash at bank and on hand		3,029	21,182	799
Short-term deposits		13,810	–	6,630
Closing cash and cash equivalents balance		**16,839**	**21,182**	**7,429**

The accompanying 'Notes to the financial statements' are an integral part of, and should be read in conjunction with, these financial statements.

NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2018

1. Revenue and other gains

Rendering of services

The Group uses the 'percentage-of-completion method' to determine the appropriate amount of revenue to recognise in a given period. The stage of completion is measured by reference to the contract costs incurred up to the end of the reporting period as a percentage of total estimated costs for each contract.

Goods sold

Revenue from the sale of goods is measured at the fair value of the consideration received or receivable, net of returns and allowances. Revenue is recognised when the significant risks and rewards of ownership have been transferred to the buyer, recovery of the consideration is probable, the associated costs and possible return of goods can be estimated reliably, and there is no continuing management involvement with the goods. The point at which the significant risks and rewards of ownership transfer to the buyer may vary and will depend on the terms of each individual sale contract.

Strategic funding

NIWA and the Crown are parties to a Strategic Science Investment Fund – Programmes Investment Contract (SSIF Contract) under which the Crown contracts NIWA to perform research activities that support NIWA's Statement of Core Purpose (SCP). Specific SCP outcomes, and their associated delivery programmes, are agreed annually with Shareholding Ministers and documented in NIWA's Statement of Corporate Intent.

For financial reporting purposes this Strategic Funding is treated as a Government Grant in terms of NZ IAS 20. Strategic Funding received and recognised during the year was $49.489 million exclusive of GST (2017: $49.489 million). All Strategic Funded projects were completed during the year.

Uninvoiced receivables and revenue in advance

The amount of revenue unbilled at balance date is represented by 'uninvoiced receivables', which are stated in proportion to the stage of completion of the transaction in the statement of financial position. Once this balance is invoiced it is transferred to trade debtors. Management believe there are no significant concentrations of risk relating to this balance.

Revenue received but not earned is recognised as 'revenue in advance' in the Statement of Financial Position.

Government grant related to an asset

During the year, NIWA received $2.5 million from the Crown (through the National eScience Infrastructure platform) as a contribution towards the purchase of a new High Performance Computing Facility. For financial reporting purposes this contribution is treated as a Government Grant in terms of NZ IAS 20. The grant has been recognised as deferred income which will be recognised in profit and loss over the useful life of the asset.

Judgement in applying accounting policies

As the Group recognises revenue from service contracts based on their stage of completion at balance date, where such contracts span more than one accounting period management must exercise its judgement over estimates of future contract costs and profitability. These revenues are also subject to ongoing reviews of underlying contracts to verify whether the latest estimates remain appropriate.

Revenue and other gains

in thousands of New Zealand dollars	2018	2017
Research		
Rendering of services	91,516	81,417
Commercial science		
Rendering of services	54,798	57,156
Sale of goods	5,101	4,044
Dividends	1	1
Total revenue and other gains	**151,416**	**142,618**

2. Operating expenses

Employee benefits

in thousands of New Zealand dollars	2018	2017
Defined contribution plans	2,988	2,822
Termination benefits	171	–
Other employee benefits	66,920	62,944
Employee benefits expense	**70,079**	**65,766**

Other expenses

in thousands of New Zealand dollars	2018	2017
Materials and supplies	9,176	7,888
Research collaboration	19,969	20,916
Property occupancy costs	6,020	6,380
Information technology	5,680	5,288
Remuneration of directors	299	297
Foreign currency (gain)/loss	(48)	(89)
Movement within doubtful debt provision	(6)	(17)
Bad debts written off	–	–
Change in the fair value of derivatives	(16)	(19)
Other expenses	16,413	15,197
Total other expenses	**57,487**	**55,841**

Auditor's remuneration

in thousands of New Zealand dollars	2018	2017
Auditor's remuneration comprises:		
Audit of the financial statements (Group)	150	146
Audit of the financial statements (Subsidiary)	27	27
Other assurance services (ACC audit)	5	6
Total auditor's remuneration	**182**	**179**

3. Employee entitlements

Liabilities for wages and salaries, including non-monetary benefits and annual leave, long service leave, retirement leave, and training leave are recognised when it is probable that settlement will be required and they are capable of being measured reliably. Provisions, in respect of employee benefits, are measured using the remuneration rate expected to apply at settlement. Employee benefits are separated into current and non-current liabilities. Current liabilities are those benefits that are expected to be settled within 12 months from balance date.

Provisions made in respect of employee benefits which are not expected to be settled within 12 months are measured at the present value of the estimated future cash outflows to be made by the Group in respect of services provided by employees up to the reporting date.

in thousands of New Zealand dollars	2018	2017
Remuneration		
Salary accrual	1,910	1,944
Annual leave	5,570	5,314
Training leave	190	238
Long service leave	853	876
Retirement leave	517	481
Total employee entitlements	**9,040**	**8,853**
Comprising:		
Current	8,168	8,044
Non-current	872	809

The provisions for long service leave, retirement leave, and training leave are dependent upon a number of factors that are determined by the expected employment period of employees, current remuneration, and the timing of employees' use of the benefits. Any changes in these assumptions will impact on the carrying amount of the liability. The employment period used to determine the appropriate long service leave liability is based upon historical average length of service. The training leave liability is based upon typical historical usage of the benefit.

4. Property, plant and equipment

Property, plant and equipment is stated at cost less accumulated depreciation to date, less any impairment losses.

Expenditure incurred on property, plant and equipment is capitalised where such expenditure will increase or enhance the future economic benefits provided by an asset's existing service potential. Expenditure incurred to maintain future economic benefits is classified as repairs and maintenance.

The gain or loss arising on the disposal or retirement of an item of property, plant and equipment is determined as the difference between the sale proceeds and the carrying amount of the asset and is recognised in the Statement of Comprehensive Income.

Property, plant and equipment items, except for freehold land and work in progress, are depreciated on a straight-line basis at rates estimated to write off their cost over their estimated useful lives, which are as follows:

Category	Useful life
Buildings and leasehold improvements	5–40 years
Vessels	20–31 years
Plant and equipment	8–10 years
IT equipment	3–8 years
Office equipment	5 years
Furniture and fittings	10 years
Motor vehicles	6 years
Small boats	10 years

Assumptions underlying the estimated useful life of assets include timing of technological obsolescence and future utilisation plans.

Major source of uncertainty

The useful lives of items of property, plant and equipment are key assumptions concerning the future that have a significant risk of resulting in a material adjustment to the carrying amounts of assets and liabilities within the next financial year.

The Group reviews the estimated useful lives of property, plant and equipment items during each annual reporting period.

NIWA Annual Report 2017/18

in thousands of New Zealand dollars	Land	Buildings & leasehold improvements	Vessels	Plant & equipment	It equipment	Office equipment	Furniture & fittings	Motor vehicles	Small boats	Work in progress	Total
Cost											
Balance at 1 July 2017	15,726	52,480	41,234	89,984	23,624	6,683	1,380	4,390	3,296	1,476	240,273
Additions	–	915	–	6,893	18,088	441	38	517	279	5,423	32,594
Transfers	(70)	212	–	640	291	–	15	–	136	(1,476)	(252)
Disposals	–	(693)	(6)	(818)	(10,796)	(93)	–	(340)	(256)	–	(13,002)
Foreign currency adjustment	–	–	–	7	6	(2)	–	1	–	–	12
Balance at 30 June 2018	15,656	52,914	41,228	96,706	31,213	7,029	1,433	4,568	3,455	5,423	259,625
Accumulated depreciation and impairment losses											
Balance at 1 July 2017	–	29,956	22,439	61,663	19,406	5,451	1,110	3,060	2,011	–	145,096
Depreciation	–	2,244	2,122	6,645	2,329	465	45	441	157	–	14,448
Transfers	–	(64)	–	–	–	–	–	–	–	–	(64)
Disposals	–	(671)	(2)	(611)	(10,784)	(97)	–	(340)	(256)	–	(12,761)
Foreign currency adjustment	–	–	–	(1)	9	2	5	(1)	–	–	14
Balance as at 30 June 2018	–	31,465	24,559	67,696	10,960	5,821	1,160	3,160	1,912	–	146,733
Net book value at 30 June 2018	**15,656**	**21,449**	**16,669**	**29,010**	**20,253**	**1,208**	**273**	**1,408**	**1,543**	**5,423**	**112,892**
Cost											
Balance at 1 July 2016	15,635	50,766	41,532	84,613	21,260	6,348	1,255	4,321	3,157	2,248	231,135
Additions	91	665	255	5,815	1,831	535	129	557	11	1,476	11,365
Transfers	–	1,074	–	325	704	–	–	–	145	(2,248)	–
Disposals	–	(25)	(553)	(766)	(180)	(193)	(4)	(488)	(17)	–	(2,226)
Foreign currency adjustment	–	–	–	(3)	9	.(7)	–	–	–	–	(1)
Balance at 30 June 2017	15,726	52,480	41,234	89,984	23,624	6,683	1,380	4,390	3,296	1,476	240,273
Accumulated depreciation and impairment losses											
Balance at 1 July 2016	–	27,616	20,542	55,803	17,088	5,210	1,062	3,140	1,892	–	132,353
Depreciation	–	2,360	2,450	6,464	2,481	433	50	407	130	–	14,775
Disposals	–	(20)	(553)	(616)	(167)	(191)	(2)	(487)	(11)	–	(2,047)
Foreign currency adjustment	–	–	–	12	4	(1)	–	–	–	–	15
Balance as at 30 June 2017	–	29,956	22,439	61,663	19,406	5,451	1,110	3,060	2,011	–	145,096
Net book value at 30 June 2017	**15,726**	**22,524**	**18,795**	**28,321**	**4,218**	**1,232**	**270**	**1,330**	**1,285**	**1,476**	**95,177**

5. Heritage assets

NIWA has one collection and three databases that have been defined as heritage assets. Heritage collection assets are those assets held for the duration of their physical lives because of their unique scientific importance, and heritage databases are maintained as an incidental part of existing business operations.

NIWA has the following heritage assets:

Type	Description
Marine Benthic Biology Collection	A national reference collection of marine invertebrates.
National Climate Database	A national electronic database of high-quality climate information, including temperatures, rainfall, wind, and other climate elements.
Water Resources Archive Database	A national electronic database of river and lake locations throughout New Zealand, including levels, quality, and flows.
New Zealand Freshwater Fish Database	A national electronic database of the occurrence of fish in the fresh waters of New Zealand, including major offshore islands.

The nature of these heritage assets, and their significance to the science NIWA undertakes, makes it necessary to disclose them. In the directors' view, the cost of these heritage assets cannot be assessed with any reliability, and accordingly these assets have not been recognised for financial reporting purposes.

6. Identifiable intangibles

Purchased identifiable intangible assets, comprising copyrights and software, are recorded at cost less amortisation and impairment. Amortisation is charged on a straight-line basis over the assets' estimated useful lives. The estimated useful life and amortisation method are reviewed each balance date.

Category	Useful life
Copyrights	5 years
Development costs	5 years
Software	3 years

Intangible assets which arise from development costs that meet the recognition criteria are recognised as an asset in the statement of financial position.

Capitalisation is limited to the amount which, taken together with any further related costs, is likely to be recovered from future economic benefits. Any excess is recognised as an expense.

All other development and research costs are expensed as incurred.

Subsequent to initial recognition, internally generated intangible assets are reported at cost, less accumulated amortisation and accumulated impairment losses, on the same basis as purchased identifiable intangible assets.

in thousands of New Zealand dollars	Software	Copyrights	Development costs	Total
Cost				
Balance as at 1 July 2017	8,692	215	35	8,942
Additions	771	–	208	979
Disposals	(502)	–	–	(502)
Balance as at 30 June 2018	8,961	215	243	9,419
Accumulated amortisation and impairment losses				
Balance as at 1 July 2017	6,787	215	15	7,017
Amortisation	1,015	–	21	1,036
Disposals	(502)	–	–	(502)
Balance as at 30 June 2018	7,300	215	36	7,551
Net book value at 30 June 2018	**1,661**	**–**	**207**	**1,868**

in thousands of New Zealand dollars	Software	Copyrights	Development costs	Total
Cost				
Balance as at 1 July 2016	7,256	215	35	7,506
Additions	1,688	–	–	1,688
Disposals	(252)	–	–	(252)
Balance as at 30 June 2017	8,692	215	35	8,942
Accumulated amortisation and impairment losses				
Balance as at 1 July 2016	6,068	215	8	6,291
Amortisation	971	–	7	978
Disposals	(252)	–	–	(252)
Balance as at 30 June 2017	6,787	215	15	7,017
Net book value at 30 June 2017	**1,905**	**–**	**20**	**1,925**

7. Assets held for sale

Assets held for sale are stated at the lower of their carrying amount and fair value less costs to sell.

Assets with a carrying amount of $188k were reclassified as held for sale in 2018 (2017: nil). The former Greymouth office and site were deemed surplus on 25 July 2017 following the construction of a new office. The sale process is currently ongoing.

in thousands of New Zealand dollars	2018	2017
Land	70	–
Other assets	118	–
Total	**188**	**–**

8. Receivables

Receivables are stated at amortised cost using the effective interest rate, less any impairment.

Collectability of receivables is reviewed on an ongoing basis. A provision for doubtful debts is established when there is objective evidence that the Group will not be able to collect all amounts due according to the original terms of receivables. Changes in the carrying amount of the provision are recognised in the Statement of Comprehensive Income. Debts which are known to be uncollectable are written off against the provision, once approved by the Board of Directors.

in thousands of New Zealand dollars	2018	2017
Trade receivables	17,739	13,796
Sundry receivables	108	180
Provision for doubtful debts	(4)	(9)
Total	**17,843**	**13,967**
Classified as:		
Non-current	–	–
Current	17,843	13,967
Total	**17,843**	**13,967**

Included in the Group's trade receivables balance at the end of the year is one Crown debtor's balance which equates to 20% of the Group's total trade receivables balance (2017: 20%). 99% of that debtor's balance is less than 60 days over-due and is deemed to be low credit risk (2017: 97%).

The Group considers that a large proportion of its customers have a low credit risk associated with them. Before providing any service or goods to a new customer on credit terms, a check is undertaken when deemed appropriate to verify the credit-worthiness of the customer.

The Group reserves the right to charge interest at a rate of 2% per month, calculated daily, on all invoices remaining unpaid at the due date.

Included in the Group's trade receivable balance are debtors with a carrying amount of $473k (2017: $138k) which are past due at the reporting date for which the Group has not provided as the amounts are still considered recoverable. The Group does not hold any collateral over past due or impaired balances.

Included in the provision for doubtful debts are individually identified debts totalling $4k (2017: $9k) for the Group which are unlikely to be recoverable. The provision recognises the difference between the carrying amount of these trade receivables and the expected recoverable amount The net carrying amount is considered to approximate their fair value.

9. Inventory

Inventory is stated at the lower of cost and net realisable value. The basis on which cost is calculated is first in first out (FIFO) for consumables, finished goods and work in progress; and weighted average for raw materials.

in thousands of New Zealand dollars	2018	2017
Consumables	535	403
Raw materials	206	309
Finished goods	1,733	1,444
Total	**2,474**	**2,156**

10. Income tax

The income tax expense for the period is the tax payable on the current period's taxable income, based on the income tax rate for each jurisdiction. This is then adjusted by changes in deferred tax assets and liabilities attributable to temporary differences between the tax bases of assets and liabilities and their carrying amounts in the financial statements, and changes in unused tax losses.

The income tax expense is determined as follows:

in thousands of New Zealand dollars	2018	2017
Income tax expense		
Current tax	3,956	1,666
Deferred tax relating to temporary differences	(1,354)	34
Income tax expense	**2,602**	**1,700**

Reconciliation of income tax expense

in thousands of New Zealand dollars	2018	2017
Profit before income tax	**9,074**	**5,950**
Tax at current rate of 28%	2,541	1,666
Adjustments to taxation:		
Other non-deductible expenses	83	56
R&D tax concession	(29)	(47)
(Over)/under provision in previous year	7	25
Income tax expense	**2,602**	**1,700**

11. Deferred tax liability and assets

Deferred tax is accounted for using the balance sheet liability method in respect of temporary differences arising from the carrying amount of assets and liabilities in the financial statements and the corresponding tax base of those items. Deferred tax liabilities are generally recognised for all taxable temporary differences. Deferred tax assets are generally recognised for all deductible temporary differences to the extent that it is probable that a sufficient taxable amount will be available against which those deductible temporary differences can be utilised.

Deferred tax assets and liabilities are measured at the tax rates that are expected to apply to the period when the asset and liability giving rise to them are realised or settled, based on the tax laws that have been enacted or substantively enacted at balance date.

Current and deferred tax is recognised in profit or loss, except when it relates to items recognised in other comprehensive income or directly in equity, in which case the deferred or current tax is also recognised in other comprehensive income or directly in equity, or where it arises from the initial accounting for a business combination.

in thousands of New Zealand dollars *As at 30 June 2018*	Opening balance	Credited/ (charged) to profit or loss	Closing balance
Temporary differences			
Property, plant, and equipment	(6,687)	602	(6,085)
Library books	8	(3)	5
Uninvoiced receivables	(2,218)	806	(1,412)
Employee benefits	1,747	(30)	1,717
Unrealised forex gains/losses on creditors/debtors	–	(44)	(44)
Doubtful debts	3	(2)	1
R&D tax credit	63	25	88
Total	**(7,084)**	**1,354**	**(5,730)**

in thousands of New Zealand dollars *As at 30 June 2017*	Opening balance	Credited/ (charged) to profit or loss	Closing balance
Temporary differences			
Property, plant, and equipment	(7,647)	960	(6,687)
Library books	8	–	8
Uninvoiced receivables	(1,418)	(800)	(2,218)
Employee benefits	1,927	(180)	1,747
Doubtful debts	7	(4)	3
R&D tax credit	73	(10)	63
Total	**(7,050)**	**(34)**	**(7,084)**

In accordance with the Income Tax Act 2007 the Group is not required to establish or maintain an imputation credit account by virtue of its classification as a Crown Research Institute.

12. Cash and cash flows

12 a) Cash and cash equivalents and other short-term investments

Cash and cash equivalents includes cash on hand, deposits held at call with financial institutions, and other short-term, highly liquid investments with original maturities of three months or less that are readily convertible to known amounts of cash and which are subject to an insignificant risk of changes in value. Other short-term investments consist of deposits with financial institutions with maturities over three months which are presented as a separate line item in the statement of financial position.

12 b) Reconciliation of the profit for the year to net cash from operating activities

in thousands of New Zealand dollars	2018	2017
Profit for the year	**6,472**	**4,250**
Add/(less) non-cash items		
Net loss on disposal of property, plant and equipment	81	49
Depreciation and impairment	14,448	14,775
Amortisation of identifiable intangibles	1,036	978
Net foreign currency loss	39	54
	15,604	**15,856**
Add/(less) movements in working capital		
Increase/(decrease) in payables and accruals and revenue in advance	839	4,219
Increase/(decrease) in employee entitlements	187	371
Decrease/(increase) in receivables and prepayments	(4,122)	3,506
Decrease/(increase) in inventory and uninvoiced receivables	2,559	(2,997)
Increase/(decrease) in taxation payable and receivable	1,171	(230)
Increase/(decrease) in forward exchange derivatives	(16)	(19)
	618	**4,850**
Net cash flows from operating activities	**22,694**	**24,956**

13. Subsidiaries

The Group financial statements incorporate the financial statements of the Company and entities (including special purpose entities) controlled by the Company. Control is achieved where the Company has the power (including the ability to use the power) to govern the financial and operating policies of an entity so as to obtain benefits from its activities.

All intra-group transactions, balances, income, and expenses are eliminated in full on consolidation.

The subsidiaries of the Group and their activities are listed below:

Name	Country	Principal activities	Ownership
NIWA Vessel Management Ltd	New Zealand	Vessel charters for scientific research	100%
Unidata Pty Ltd	Australia	Supplier of environmental technology products	80%
EcoConnect Ltd	New Zealand	Non-trading company	100%
NIWA Australia Pty Ltd	Australia	Non-trading company	100%
NIWA Environmental Research Institute	USA	Non-trading company	100%
NIWA Natural Solutions Ltd	New Zealand	Non-trading company	100%

All subsidiaries have a balance date of 30 June.

No stake in any subsidiary was acquired or disposed of during the year.

14. Related party transactions

The Government of New Zealand (the Crown) is the ultimate shareholder of the NIWA Group. No transactions with other New Zealand Government-owned entities are considered related party transactions in terms of NZ IAS 24. No related party debts have been written off or forgiven during the year. Any business the NIWA Group has transacted in which a director or an employee has an interest has been carried out on a commercial basis. Any potential conflict is recorded in the minutes of Board meetings for directors and a separate interest register for employees. The interest register containing all relevant interests is updated on a regular and timely basis.

Key management personnel compensation

in thousands of New Zealand dollars	2018	2017
Short-term benefits	7,510	7,342

The table above includes the remuneration of the Chief Executive and all key management positions.

15. Financial instruments and risk management

The classification of financial assets and liabilities depends on the purpose for which the financial assets and liabilities were incurred. Management determines the classification of the Group's financial assets and liabilities at initial recognition.

Financial assets

Financial assets are classified on initial recognition into the following categories: at fair value through profit or loss and loans and receivables.

Financial assets and liabilities at fair value through profit or loss – Derivative financial instruments

The Group may use derivative financial instruments to hedge its exposure to foreign exchange risk arising from operational, financing, and investing activities.

Derivative financial instruments such as forward exchange contracts are categorised as held for trading (unless they qualify for hedge accounting), and are initially recognised in the statement of financial position at fair value. Transaction costs are expensed immediately. Subsequent to initial recognition, derivative financial instruments are stated at fair value. The gain or loss on re-measurement to fair value is recognised immediately in the Statement of Comprehensive Income unless the derivative is designated and effective as a hedging instrument, in which event the timing of the recognition in profit or loss depends on the nature of the hedge relationship.

Loans and receivables

Loans and receivables are non-derivative financial assets with fixed or determinable payments and are not quoted in an active market. They arise when the Group provides money, goods, or services directly to a debtor with no intention of selling the receivable. They are included in current assets, except for those with maturities greater than 12 months after the statement of financial position date which are classified as a non-current asset. These are subsequently recorded at amortised cost using the effective interest method.

Impairment of financial assets

Financial assets, other than those at fair value through profit or loss, are assessed for indicators of impairment at each balance date. Financial assets are impaired where there is objective evidence that, as a result of one or more events that occurred after the initial recognition of the financial asset, the estimated future cash flows of the investment have been impacted.

For certain categories of financial assets, such as trade receivables, assets that are assessed not to be impaired individually are subsequently assessed for impairment on a collective basis. Objective evidence of impairment for a portfolio of receivables could include the Group's past experience of collecting payments, an increase in the number of delayed payments in the portfolio past the average credit period, as well as observable changes in national or local economic conditions that correlate with default on receivables.

The carrying amount of the financial asset is reduced by the impairment loss with the exception of trade receivables, where the carrying amount is reduced through the use of a provision. When a trade receivable is considered uncollectible, it is written off against the provision. Changes in the carrying amount of the provision are recognised in the Statement of Comprehensive Income.

Financial liabilities

Financial liabilities are classified as either financial liabilities at fair value through profit or loss or other financial liabilities. Financial liabilities are classified as fair value through profit or loss where the liability is either held for trading or it is designated as fair value. A financial liability is classified as held for trading if it meets similar criteria as financial assets held for trading.

Other financial liabilities are initially measured at fair value through profit or loss, net of transaction costs. Other financial liabilities are subsequently measured at amortised cost using the effective interest method, with interest expense recognised on an effective interest basis.

The Group derecognises financial liabilities when, and only when, the Group's obligations are discharged, cancelled, or they expire.

Capital management

The Group has the following requirements imposed upon it under the Crown Research Institutes Act 1992:

- to operate in a financially responsible manner so that sufficient operating funds are generated to maintain financial viability;
- to provide an adequate rate of return on shareholders' funds; and
- to operate as a going concern.

The Group's policy is to maintain a strong capital base so as to maintain investor and creditor confidence and to sustain future development of the business.

The Group's policies in respect of capital management and allocation are reviewed regularly by the Board of Directors.

The advance facility available from ANZ Bank (refer note 15 subsection financing facilities) is subject to two covenants:

1. That the value of the Group's net tangible assets is greater than $50 million; and
2. That ANZ reserves the right to review the facility in the event of a change in the shareholding structure.

Capital refers to the equity and borrowings of the Group.

There have been no material changes in the Group's management of capital during the period.

Fair value of financial instruments

The carrying value of all financial instruments is considered to approximate fair value.

All of the Group's financial instruments are classified as being within level 2 of the fair value hierarchy as defined by NZ IFRS 13 Fair Value Measurement (2017: the same). Their fair value is determined with reference to quoted rates for identical instruments on active markets.

Credit risk

Credit risk is the risk that a third party will default on its obligations to NIWA and the Group, causing a loss.

In the normal course of business, the Group incurs credit risk from trade receivables, uninvoiced receivables, and transactions with financial institutions (cash and short-term deposits and derivatives).

The Group has a credit policy that is used to manage this risk. As part of this policy, limits are placed on the amounts of credit extended to third parties, and care is taken to ensure the credit-worthiness of third parties dealt with. All credit risk exposures are monitored regularly.

The Group does not require any collateral or security to support financial instruments, because of the quality of financial institutions and counterparties it deals with. There are no significant concentrations of credit risk other than with the New Zealand Government which the Group does not consider to represent a material credit risk.

The exposure to the Group to credit risk as at 30 June 2018 was $44,725k (total exposure to credit risk, comprising cash and cash equivalents $16,839k, other short-term investments $5,000k, uninvoiced receivables $5,043k, and receivables net of provisions $17,843k) (2017: $54,316k).

Further analysis on the trade receivables balance can be found in note 8.

The Group has not renegotiated the terms of any financial assets which would result in the carrying amount no longer being past due or avoid a possible past due status.

The Group's maximum exposure to credit risk by geographic region is as follows:

in thousands of New Zealand dollars	2018	2017
New Zealand	42,185	50,600
Australia	1,107	958
USA	445	108
Other Asia Pacific countries	800	2,606
Other regions	192	53
Provision for doubtful debts	(4)	(9)
Total credit risk	**44,725**	**54,316**

Interest rate risk

Interest rate risk is the risk that cashflows will fluctuate because of changes in market interest rates. This could particularly affect the return on investments.

The interest rates on the Group investments as at 30 June:

	2018	2017
Cash (on call)	1.75%	1.75%
Other short-term investments	2.49% – 3.38%	2.47% – 3.69%

The directors do not consider there is any significant exposure to interest rate risk.

Currency risk

The Group undertakes transactions in foreign currencies from time to time, and, resulting from these activities, exposures in foreign currency arise. It is the Group's policy to hedge foreign currency trading transaction risks economically as they arise. To manage these exposures, the Group may use financial instruments such as forward foreign exchange contracts. At balance date, the Group had forward foreign exchange arrangements in place with a New Zealand dollar (NZD) fair value of $1k (2017: $17k).

The Group's exposure to foreign currency denominated non-derivative financial instruments was as follows, based on notional amounts:

30 June 2018 in thousands of New Zealand dollars	AUD	EUR	USD	FJD	GBP	CAD
Cash balances	305	1	2	–	13	2
Trade receivables	751	81	485	30	–	–
Trade payables	(236)	(45)	(55)	–	(7)	(3)
Statement of financial position exposure	820	37	432	30	6	(1)

30 June 2017 in thousands of New Zealand dollars	AUD	EUR	USD	FJD	GBP	CAD
Cash balances	394	7	34	–	3	14
Trade receivables	466	30	129	41	–	–
Trade payables	(219)	(66)	(91)	–	(66)	–
Statement of financial position exposure	641	(29)	72	41	(62)	14

NIWA has a regularly reviewed treasury management policy in place which ensures the appropriate management of currency risk.

Liquidity risks

Liquidity risk represents the Group's ability to meet its contractual obligations. The Group evaluates its liquidity requirements on an ongoing basis. In general, the Group generates sufficient cash flows from its operating activities to meet its obligations arising from its financial liabilities and has credit lines in place to cover potential shortfalls.

Payables and accruals of $8.670 million (2017: $8.372 million) having a maturity of less than one year are the Group's contractual maturity. This is based upon the earliest date on which the Group can be required to pay.

Financing facilities

The Group has access to financing facilities made available by ANZ Bank with a total value of $10.5 million (2017: $10.5 million). This was undrawn at 30 June 2018 (2017: also undrawn). The total facility of $10.5 million relates to an overdraft facility of $0.5 million (on-call) and an overnight placement and short term advance facility of $10 million (2017: $10.5 million).

16. Leases

Leases are classified as finance leases whenever the terms of the lease transfer substantially all of the risks and rewards of ownership to the lessee. All other leases are classified as operating leases.

Operating lease payments are recognised on a systematic basis that is representative of the benefit to the Group (straight line).

in thousands of New Zealand dollars	2018	2017
Lease expense recognised in the year	2,270	2,256
Obligations payable after balance date on non-cancellable operating leases:		
Within 1 year	2,636	2,555
Between 1 and 2 years	1,843	1,885
Between 2 and 5 years	915	2,542
Over 5 years	2,734	2,852
Total obligations payable	**8,128**	**9,834**

Operating leases relate to office and laboratory facilities within New Zealand and Australia with lease terms between 1 and 11 years, with various options to extend.

17. Capital commitments

in thousands of New Zealand dollars	2018	2017
Commitments for future capital expenditure		
Contracted, but not provided for	3,792	20,200

18. Contingent liabilities

The ground lease over the Hamilton office site includes a clause that requires the site to be restored at the end of the lease. Ongoing negotiations over the future use of the site mean that it is not yet probable that NIWA will be required to restore the site, therefore no provision for this has been included in the financial statements for site restoration. Quantity surveyors have provided an estimate of the costs for restoring the site (including demolition of buildings) which is disclosed below as a contingent liability.

in thousands of New Zealand dollars	2018	2017
Site restoration lease clause	500	–

19. Subsequent events

There are no material events occurring subsequent to 30 June 2018 which require adjustment or disclosure in the financial statements.

PREPARATION DISCLOSURES

Reporting entity

National Institute of Water and Atmospheric Research Limited ('NIWA' or 'the Company') and its subsidiaries form the consolidated Group ('the NIWA Group' or 'the Group'). NIWA is a profit-oriented company registered in New Zealand under the Companies Act 1993.

The financial statements for the NIWA Group are presented in accordance with the requirements of the Crown Research Institutes Act 1992, the Crown Entities Act 2004, the Public Finance Act 1989, the Companies Act 1993, and the Financial Reporting Act 2013.

Nature of activities

The NIWA Group conducts research and commercial science in water and atmospheric sciences in New Zealand and internationally.

Basis of preparation

The measurement basis adopted in the preparation of these financial statements is historical cost, except for financial instruments as identified in specific accounting policies above.

The presentation currency of the Group and functional currency used in the preparation of these financial statements is New Zealand dollars.

All amounts disclosed in the financial statements and notes have been rounded to the nearest thousand New Zealand dollars unless otherwise stated.

Accounting policies are selected and applied in a manner that ensures that the resulting financial information meets the concepts of relevance and reliability, ensuring that the substance of the underlying transaction or event is reported.

The accounting policies have been applied in preparing the financial statements for the year ended 30 June 2018 and the comparative information for the year ended 30 June 2017.

The 2018 Statement of Corporate Intent (SCI) Budget that is used for comparative information is not audited.

Statement of compliance

The financial statements have been prepared in accordance with New Zealand generally accepted accounting practice (NZ GAAP). They comply with New Zealand Equivalents to International Financial Reporting Standards (NZ IFRS) and other applicable financial reporting standards appropriate for profit-oriented entities.

The financial statements comply with International Financial Reporting Standards (IFRS).

Goods and services tax (GST)

These financial statements are prepared on a GST-exclusive basis, except for receivables and payables, which are stated GST-inclusive.

Foreign currencies

Transactions

Transactions in foreign currencies are converted to the functional currency of the Group, being New Zealand dollars, by applying the spot exchange rate between the functional currency and the foreign currency at the date of transaction. At the end of each reporting period, monetary assets and liabilities are translated to New Zealand dollars using the closing rate of exchange at balance date, and any exchange gains or losses are recognised in the statement of comprehensive income.

Translation of foreign operations

On consolidation, revenues and expenses of foreign operations are translated to New Zealand dollars at the average exchange rates for the period. Assets and liabilities are converted to New Zealand dollars at the rates of exchange ruling at balance date. Exchange rate differences arising from the translation of the foreign operations are recognised in other comprehensive income and accumulated as a separate component of equity in the Group's foreign currency translation reserve. Such exchange differences are reclassified from equity to profit or loss (as a reclassification adjustment) when the foreign operation is disposed of.

Adoption of new and revised standards

Certain new accounting standards and interpretations have been published that are not mandatory for 30 June 2018 reporting periods and have not been early adopted by the Group.

The key items applicable to the Group are:

NZ IFRS 9: Financial Instruments (effective for accounting periods beginning on or after 1 January 2018)

NZ IFRS 9 addresses the classification, measurement and recognition of financial assets and financial liabilities. It replaces the guidance in NZ IAS 39 that relates to the classification and measurement of financial instruments. Whilst there are some changes to classification and determination of impairment of financial assets, there is no material impact from the adoption of this standard.

The Group will adopt NZ IFRS 9 on 1 July 2018.

NZ IFRS 15: Revenue from contracts with customers (effective for annual periods beginning on or after 1 January 2018)

NZ IFRS 15 deals with revenue recognition and establishes principles for reporting useful information to users of financial statements about the nature, amount, timing and uncertainty of revenue and cash flows arising from an entity's contracts with customers. Revenue is recognised when a customer obtains control of a good or service and thus has the ability to direct the use and obtain the benefits from the good or service. The standard replaces NZ IAS 18 'Revenue' and NZ IAS 11 'Construction contracts' and related interpretations.

The Group will adopt NZ IFRS 15 on 1 July 2018. NIWA has completed a detailed impact analysis. All contracts have been reviewed to consider when revenue can be recognised. There are some changes to revenue recognition, but these are not material.

NZ IFRS 16: Leases (effective for annual periods beginning on or after 1 January 2019)

NZ IFRS 16 replaces the current guidance in NZ IAS 17. NZ IFRS 16 now requires a lessee to recognise a lease liability reflecting future lease payments and a 'right-of-use asset' for virtually all lease contracts. An optional exemption is included for certain short-term leases and leases of low-value assets; however, this exemption can only be applied by lessees.

The Group intends to adopt NZ IFRS 16 on 1 July 2019. The Group will recognise a right-to-use asset and a corresponding lease liability for the majority of leases currently treated as operating leases.

There are no other standards that are not yet effective and that would be expected to have a material impact on the Group.

AUDITOR'S REPORT

pwc

Independent auditor's report

To the readers of National Institute of Water and Atmospheric Research Limited's Group Financial Statements for the year ended 30 June 2018

The Auditor-General is the auditor of National Institute of Water and Atmospheric Research Limited and its controlled entities (the Group). The Auditor-General has appointed me, Karen Shires, using the staff and resources of PricewaterhouseCoopers, to carry out the audit of the financial statements of the Group on his behalf.

Our opinion

We have audited the financial statements of the Group on pages 103 to 116, that comprise the statement of financial position as at 30 June 2018, the statement of comprehensive income, statement of changes in equity and cash flow statement for the year ended on that date and the notes to the financial statements that include accounting policies and other explanatory information.

In our opinion, the financial statements of the Group:

- present fairly, in all material respects, its financial position as at 30 June 2018 and its financial performance and cash flows for the year then ended; and
- comply with generally accepted accounting practice in New Zealand in accordance with New Zealand Equivalents to International Financial Reporting Standards (NZ IFRS) and International Financial Reporting Standards.

Our audit was completed on 17 August 2018. This is the date at which our opinion is expressed.

The basis for our opinion is explained below. In addition, we outline the responsibilities of the Board of Directors and our responsibilities relating to the financial statements, we comment on other information, and we explain our independence.

Basis for our opinion

We carried out our audit in accordance with the Auditor-General's Auditing Standards, which incorporate the Professional and Ethical Standards and the International Standards on Auditing (New Zealand) issued by the New Zealand Auditing and Assurance Standards Board. Our responsibilities under those standards are further described in the Responsibilities of the auditor section of our report.

We have fulfilled our responsibilities in accordance with the Auditor-General's Auditing Standards.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Responsibilities of the Board of Directors for the financial statements

The Board of Directors is responsible on behalf of the Group for preparing financial statements that are fairly presented and that comply with generally accepted accounting practice in New Zealand.

The Board of Directors is responsible for such internal control as it determines is necessary to enable it to prepare financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, the Board of Directors is responsible on behalf of the Group for assessing the Group's ability to continue as a going concern. The Board of Directors is also responsible for disclosing, as applicable, matters related to going concern and using the going concern basis of accounting, unless the Board of Directors has to cease operations, or has no realistic alternative but to do so.

The Board of Directors' responsibilities arise from the Crown Research Institutes Act 1992.

Responsibilities of the auditor for the audit of the financial statements

Our objectives are to obtain reasonable assurance about whether the financial statements, as a whole, are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion.

Reasonable assurance is a high level of assurance, but it is not a guarantee that an audit carried out in accordance with the Auditor-General's Auditing Standards will always detect a material misstatement when it exists. Misstatements are differences or omissions of amounts or disclosures and can arise from fraud or error. Misstatements are considered material if, individually or in the aggregate, they could reasonably be expected to influence the decisions of readers taken on the basis of these financial statements.

For the budget information reported in the financial statements, our procedures were limited to checking that the information agreed to the Group's Statement of Corporate Intent.

We did not evaluate the security and controls over the electronic publication of the financial statements.

As part of an audit in accordance with the Auditor-General's Auditing Standards, we exercise professional judgement and maintain professional scepticism throughout the audit. Also:

- We identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- We obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances but not for the purpose of expressing an opinion on the effectiveness of the Group's internal control.
- We evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by the Board of Directors.
- We conclude on the appropriateness of the use of the going concern basis of accounting by the Board of Directors and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Group's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Group to cease to continue as a going concern.
- We evaluate the overall presentation, structure and content of the financial statements, including the disclosures and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.
- We obtain sufficient appropriate audit evidence regarding the financial statements of the entities or business activities within the Group to express an opinion on the consolidated financial statements. We are responsible for the direction, supervision and performance of the Group audit. We remain solely responsible for our audit opinion.

We communicate with the Board of Directors regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

Our responsibilities arise from the Public Audit Act 2001.

Other information

The Board of Directors is responsible for the other information. The other information comprises the information included on pages 1 to 120, but does not include the financial statements, and our auditor's report thereon.

Our opinion on the financial statements does not cover the other information and we do not express any form of audit opinion or assurance conclusion thereon.

In connection with our audit of the financial statements, our responsibility is to read the other information. In doing so, we consider whether the other information is materially inconsistent with the financial statements or our knowledge obtained in the audit, or otherwise appears to be materially misstated. If, based on our work, we conclude that there is a material misstatement of this other information, we are required to report that fact. We have nothing to report in this regard.

Independence

We are independent of the Group in accordance with the independence requirements of the Auditor-General's Auditing Standards, which incorporate the independence requirements of Professional and Ethical Standard 1 (Revised): *Code of Ethics for Assurance Practitioners* issued by the New Zealand Auditing and Assurance Standards Board.

In addition to the audit, we have carried out an ACC Partnership Program assurance engagement, which is compatible with those independence requirements. Other than the audit and this engagement, we have no relationship with, or interests in, the Group.

Karen Shires
PricewaterhouseCoopers
On behalf of the Auditor-General
Auckland, New Zealand

CORPORATE GOVERNANCE AND DISCLOSURES

Board and committee meeting attendance

The Board held 11 full meetings and one special meeting during the year. The Audit, Legislative Compliance and Risk Committee (ALCR Committee) held four meetings during the year. The table below shows director attendance at these Board meetings and committee member attendance at committee meetings. In addition, any director may attend any committee meeting.

Director	Board meetings	Special Board meetings	ALCR committee meetings*
Sir Christopher Mace, KNZM *(Chairman)*	11	1	4**
Nicholas Main *(Deputy Chairman)*	11	1	3
Dr Helen Anderson	10	1	–
Prof. Keith Hunter	10	1	–
Prof. Gillian Lewis	11	1	–
Michael Pohio	9	1	4
Jason Shoebridge	10	1	4

* *Only attendances by ALCR Committee members are recorded.*
** *Sir Christopher Mace attends ALCR Committee meetings in an ex officio capacity.*

Directors' remuneration

The total remuneration received or receivable by directors of NIWA during the year was:

in thousands of New Zealand dollars	2018	2017
Sir Christopher Mace, KNZM *(Chairman)*	72	72
Nicholas Main *(Deputy Chairman)*	45	45
Dr Helen Anderson	36	36
Prof. Keith Hunter	36	36
Prof. Gillian Lewis	36	36
Michael Pohio	36	36
Jason Shoebridge	36	36

Subsidiary company directors

The following people held office as directors of NIWA's subsidiary companies at 30 June 2018:

Subsidiary company	Directors
NIWA Vessel Management Ltd	C Mace, N Main, H Anderson, K Hunter, G Lewis, M Pohio, J Shoebridge
Unidata Pty Ltd	B Cooper [1], B Biggs [1], D Saunders [2]
EcoConnect Ltd	J Morgan [1], P Baker [1]
NIWA Australia Pty Ltd	C Mace, N Main, H Anderson, K Hunter, G Lewis, M Pohio, J Shoebridge
NIWA Environmental Research Institute	C Mace, N Main, H Anderson, K Hunter, G Lewis, M Pohio, J Shoebridge
NIWA Natural Solutions Ltd	J Morgan [1], P Baker [1]

1. Employee of the Group's parent company.
2. Appointed by the minority ownership interest in Unidata Pty Ltd.

No fees were paid in respect of membership of subsidiary boards.

Insurance for directors and employees

The NIWA Group has arranged insurance policies for directors and employees which, with a deed of indemnity, ensure that they will generally incur no monetary loss as a result of lawful actions undertaken by them as directors or employees. These include, among others, directors and officers and professional indemnity policies. Certain risks are specifically excluded from the cover provided, including the imposition of penalties and fines in respect of breaches of the law.

Auditors

In accordance with Section 21(1) of the Crown Research Institutes Act 1992, the Group's auditor is the Auditor-General. The Auditor-General has appointed Karen Shires of PricewaterhouseCoopers to conduct the audit on his behalf. The audit remuneration and fees paid for other services are detailed in note 2.

Interests register

The following are transaction types recorded in the interests register for the year.

Interested transactions

Any business the NIWA Group has transacted in which a director has an interest has been carried out on a commercial basis. Any potential conflict is recorded in the minutes of Board meetings. A register containing all relevant interests is updated on a monthly basis.

Directors' remuneration

Details of the directors' remuneration are provided in the 'Directors' remuneration' section above.

Use of company information by directors

Pursuant to section 145 of the Companies Act 1993 there were no recorded notices from directors requesting to use company information received in their capacity as directors that would not otherwise have been available to them.

Share dealings

During the year no director purchased, disposed of, or had recorded dealings of any equity securities of the NIWA Group.

Directors' loans

No loans by the NIWA Group to any director were made or were outstanding during the year.

Employees' remuneration

The number of employees (not including directors) whose remuneration exceeded $100,000 during the year, stated in brackets of $10,000, was:

	2018
100,000–109,999	60
110,000–119,999	52
120,000–129,999	34
130,000–139,999	21
140,000–149,999	8
150,000–159,999	8
160,000–169,999	12
170,000–179,999	9
180,000–189,999	4
190,000–199,999	7
200,000–209,999	3
210,000–219,999	2
300,000–309,999	1
310,000–319,999	1
330,000–339,999	1
340,000–349,999	1
350,000–359,999	1
630,000–639,999	1

The remuneration reflected in the above table comprises base salary and at-risk salary components. This excludes payments in respect of superannuation or in respect of the cessation of employment of employees.

In 2018, the Group made payments of $171k for compensation or other benefits in respect of the cessation of employment of employees (2017: Nil).

Donations

Donations of $3,957 were made during the year (2017: $4,219).

STATEMENT OF RESPONSIBILITY

The following statement is made in accordance with section 155 of the Crown Entities Act 2004.

1. The Board of the Company is responsible for the preparation of these financial statements and the judgements used therein.
2. The Board of the Company is responsible for establishing and maintaining a system of internal controls designed to provide reasonable assurance as to the integrity and reliability of financial reporting.
3. In the opinion of the Board, these financial statements reflect a true and fair view of the financial position and operations of the Group for the year ended 30 June 2018.

Barry Harris
Chairman

Nicholas Main
Deputy Chairman

17 August 2018

DIRECTORY

Directors

Barry Harris Chairman (appointed 1 July 2018)
Sir Christopher Mace, KNZM Chairman (until 30 June 2018)
Nicholas Main Deputy Chairman
Dr Helen Anderson
Dr Tracey Batten (appointed 1 July 2018)
Prof. Keith Hunter (until 30 June 2018)
Prof. Gillian Lewis
Mary-Anne Macleod (appointed 1 July 2018)
Michael Pohio
Jason Shoebridge (until 30 June 2018)

Executive Team

John Morgan (Chief Executive)
Geoff Baird (General Manager, Communications & Marketing)
Patrick Baker (Chief Financial Officer)
Dr Barry Biggs (General Manager, Technology & Innovation)
Dr Bryce Cooper (General Manager, Strategy)
Dr Mary-Anne Dehar (General Manager, People & Capability)
Dr Rob Murdoch (General Manager, Research)
Dr Helen Neil (General Manager, Operations)

Registered office and address for service

41 Market Place
Auckland Central 1010
New Zealand

Auditor

Karen Shires with the assistance of PricewaterhouseCoopers on behalf of the Auditor-General

Bankers

ANZ Bank New Zealand Ltd

Solicitors

Meredith Connell
Atkins Holm Majurey

Insurance broker

Marsh Ltd

Head office

41 Market Place
Auckland Central 1010
Private Bag 99 940
Newmarket 1149, Auckland
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Website and social media

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facebook.com/nzniwa
twitter.com/niwa_nz
twitter.com/niwaweather
linkedin.com/company/niwa


NIWA
Taihoro Nukurangi
Climate, Freshwater & Ocean Science