Authors: Stephen Flood[1]*, Peter Edwards[2] Karen Fisher[3], Roa Crease[3], Stephan Rupp[4]

*Corresponding Author

1 Manaaki Whenua Landcare Research
2 Scion
3 University of Auckland
4 Branz Ltd

Sustainable Development Goals Think-Piece Final Report

Prepared for: Our Land and Water National Science Challenge

March 2018

Manaaki Whenua Landcare Research, Level 14 Prime Property Tower 86-90 Lambton Quay Wellington 6011 Phone +64 4 382 6649

Acknowledgements: The writing team would like to thank Our Land and Water for providing the opportunity to develop this report. They would also like to thank the strategic advisors on the project and extend a special thank you to reviewers Dr. Vicki Compton, Professor Girol Karacaoglu, and Professor Richard Le Heron for their comments and suggestions on the Think-Piece.

Table of Contents

1. Executive summary

This Think-Piece brings together the international agenda of the UN Sustainable Development Goals (SDGs) and the New Zealand Science agenda of the National Science Challenges (NSCs). It highlights an opportunity for New Zealand to show leadership and make a distinctive and lasting contribution towards the SDG Agenda, which has the potential to increase the capabilities of New Zealand's science and science institutions and its standing internationally.

The work outlines the state of play in relation to SDG implementation in New Zealand and internationally as reflected in the literature. It presents findings on where the National Science Challenges might best build on synergies between the SDGs and their science programmes based on feedback from the National Science Challenge Directors, exploratory NSC case study examples, and insights from the Think-Piece writing team.

The results of our work provides some guidance on how New Zealand might realise the SDG Agenda by considering what needs to happen to give effect to the goals, who should hold responsibility for the goals in a New Zealand context, and how existing science might inform and help measure progress towards the goals.

The Think-Piece findings, drawing on the evidence at hand, suggest that New Zealand needs to increase its ambition in relation to the SDG Agenda. The evidence demonstrates that New Zealand needs to close the action gap, particularly in light of the Government's Confidence and Supply agreement, which states a desire to take the SDG Agenda seriously and to prioritise efforts towards achieving it.

Specifically, there needs to be a direction from government, ideally in the form of a Cabinet Paper, with clear recommendations. The SDG targets and indicators relevant to New Zealand should be outlined, and an implementation and monitoring strategy should be provided with associated programmes of work. Guidance from central Government on what it sees as priorities and an approach for SDG implementation and reporting will help narrow the scope and provide direction for research that will support New Zealand's objectives.

To most effectively progress towards achieving the SDGs, responsibility will need to be dispersed across all of New Zealand (CRIs, government, universities, NGOs, industry, communities). Given that NSCs are mission-led, cross-disciplinary and involve research organisations, industry, government and non-governmental organisations, they are well placed to play a role in reflecting the efforts of a broad range of stakeholders and their complementary efforts towards achieving the SDGs.

The case study examples provided in this report provide a basis for establishing how existing science outputs from the NSCs can help to inform and measure progress towards the goals. A logical next step would be to determine how the agencies tasked with reporting on the goals can use these science outputs in their reporting.

Crucial to utilising existing information will be data access and interoperability – two issues that the science system have recognised are weaknesses and need addressing for better understanding our natural assets. There is growing momentum in the science system to address this in a collaborative

way, and demonstrate how the NSCs can work across Challenges and their host organisations/Challenge partners to allow for a systems-based utilisation of information produced.

2. Introduction

2.1. Background to the Think-Piece

In 2017, National Science Challenge Directors began a discussion about linkages between the New Zealand National Science Challenges (NSCs) and the 2015 United Nations Sustainable Development Goals (SDGs). The NSCs were set up in 2014 as mission-led projects to address complex issues for New Zealand that would require substantial science knowledge for their resolution. The current NSCs encompass community health, the natural and built environments, the primary sector, natural hazards, climate change, our coast and oceans, climate change and technology. The 17 SDGs, built on the Millennium Development Goals, are a global call to action to end poverty, protect the planet and ensure peace and prosperity. They encompass similar and complementary areas as the NSCs, including climate change, innovation and sustainable consumption.

The New Zealand government has made a commitment to achieving the SDGs and recognising the importance of cross-government, private sector and civil society collaborations in doing so. Notwithstanding NZ's commitment, the goals have as yet no "home" within government, no implementation plan, and no analysis of the science required to understand their achievement (including barriers and drivers).

The Our Land and Water NSC director noted that many of the outcomes expressed in the SDGs appear to be highly relevant to the mission statements of the NSCs. Consequently a Request for Proposal (RFP) was prepared in September 2017, asking for expressions of interest in developing a think piece on the role the NSCs might play in helping to give effect to achieving the SDGs in New Zealand. This Our Land and Water RFP was supported by five additional NSCs (Sustainable Seas, New Zealand's Biological Heritage, Science for Technological Innovation, Building Better Homes, Towns and Cities, and Resilience to Nature's Challenges). This resulting think-piece provides an examination of the nature of the relationship between the NSCs and the SDGs. It was guided by the overarching question "*To what extent, and in what ways, are the missions and objectives of the National Science Challenges aligned to the outcomes sought from the UN SDGs, and how might knowledge generated by the Challenges support the attainment of the SDGs in New Zealand?"*

2.1.1 The NSCs

The 11 National Science Challenges (NSC) take a strategic approach to the government's science investment by targeting large-scale intractable problems of national significance with the purpose of ensuring major and enduring benefits for New Zealand (MBIE, 2017a). The Ministry of Business, Innovation and Employment (MBIE) allocated $326.4 million over ten years, in two phases (Phase I from July 2015 until June 2019, and Phase II from July 2019 until June 2024). The NSCs are not 'business as usual' but are instead mission-led programmes comprising best science teams working collaboratively across disciplines and institutions including universities, Crown Research Institutes,

businesses and non-governmental organisations. Integrative and collaborative research to achieve outcomes and to produce new knowledge is at the core of the science approach.

All Challenge research is required to give effect to the Vision Mātauranga (VM) policy (Ministry of Research Science and Technology, 2007; New Zealand Gazette, 2017) whose mission statement is "to unlock the innovation potential of Māori knowledge, resources and people to assist New Zealanders to create a better future" (Ministry of Research and Technology, 2007, p. 2). The VM framework provides strategic direction for research of relevance to Māori and focuses on four themes: (1) Indigenous Innovation; (2) *Taiao* (environment); (3) *Hauora/Oranga* (health/wellbeing); and, (4) *Mātauranga* (knowledge). The VM policy provides the enabling conditions within the Challenges to promote Māori-led and Māori-centric research, and provides opportunities to create knowledge and foster innovation that benefits all New Zealanders.

An outline of all 11 Challenge mission statements, visions and goals, objectives, and themes when presented are provided in Table 1 below. The 6 Challenges that are the focus of this Think-Piece are presented first.

Table 1. The 11 National Science Challenges with summaries including missions and visions

Challenge	Mission	Vision	Other
Building Better Homes, Towns and Cities	Co-created innovative research; Transform dwellings into homes and communities; Hospitable, productive and protective.	Built environments that build communities.	
New Zealand's Biological Heritage	Reverse decline of New Zealand's biological heritage; Deliver step change in research innovation, globally leading technology and community and sector action.		*Goals*: • Protect and restore; • Eliminate threats; • Detect and eradicate; • Restore healthy freshwater; • Track our progress.
Our Land and Water	Enhance primary sector production and productivity; Maintain and improve land and water quality.	New Zealand is world renowned for integrated and successful land-based primary production, supporting healthy land and water and capable people.	
Resilience to Nature's Challenges	Partner with multiple stakeholders; Co-create research solutions; Transformative pathway to resilience to nature's challenges; Tackle wicked problems facing our changing cultural, built, economic and natural environments.	New Zealand people transform their lives, enterprises and communities to anticipate, adapt and thrive in the face of nature's challenges.	
Science for Technological Innovation	New Zealand's capacity to use physical sciences and engineering for economic growth.	Vibrant and prosperous technology driven economy; New businesses offering high value services and products that may not yet be invented.	

Sustainable Seas			*Objective:* Enhance the value of New Zealand's marine resources, while providing a healthy marine environment.
A Better Start	Predict, prevent and treat obesity, learning and mental health.	Healthy weight, good learning, skills and mental health are key to a healthy and successful life.	
Ageing Well	Push back disability threshold to enable all New Zealanders to reach their full potential.	Add life to years for all older New Zealanders.	
Healthier Lives	Deliver the right prevention to the right population and the right treatment to the right patient.	Healthier lives for all New Zealanders.	Reduction in burden of non-communicable diseases is substantially reduced.
High Value Nutrition	Growing New Zealand food and beverage revenue through international leadership in the science of food and health relationships.	Develop: High value foods with validated health benefits; Drive economic growth through research excellence.	*Research themes*: • Clinical application; • Biomarkers; • Meeting consumer preferences; • Food science and technology.
Deep South	Enable New Zealand to adapt, manage risk and thrive in a changing climate.		*Objective:* Understand the role of the Antarctic and Southern Ocean in determining our climate and future environment.

2.1.2 The Sustainable Development Goals (SDGs)

In September 2015 the SDGs were ratified by 193 countries, including New Zealand. The SDGs include 17 goals and associated targets, and are part of the United Nations Transforming our World: the 2030 Agenda for Sustainable Development, or Agenda 2030. This work builds on the Millennium Development Goals (MDGs) and provides a universal plan of action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity (United Nations, 2015). The SDGs are a broad and interrelated set of goals that cover a range of social, economic, environmental and development issues (United Nations, 2015; Esquival, 2016). Each goal has specific targets to be achieved by 2030. Unlike the MDGs, which focused primarily on improving the circumstances for those in developing countries, the SDGs do not distinguish between developed and developing countries. Therefore, they represent a call to action for all countries. The goals provide guidelines and targets for countries to adopt in accordance with their own priorities. Responsibility for implementing the goals and reviewing progress towards achieving the targets largely falls to national governments, who are expected to establish national frameworks to coordinate action and reporting.

2.1.3 Science and the SDGs

The SDGs re-emphasise the importance of integrated research approaches to sustainable development, especially in light of the interactions and connections between the goals. Science provides inputs to many of the complex problems the SDGs seek to address, with scientists identified as important actors in policy making, implementation and monitoring, ensuring science-informed analysis of interactions across SDGs and enabling more coherent and effective decision-making based on scientific evidence (Hummel et al., 2017; ICSU, 2017). Lu et al., (2015) urge scientists to support the SDGs and identify five priorities that require intervention by scientists, social scientists and economists to achieve the SDGs: 1) devising metrics; 2) establishing monitoring mechanisms; 3) evaluating progress; enhancing infrastructure to support observations, monitoring and information processing; and 5) standardising and verifying data.

2.2 Changing political climate towards the SDGs

New Zealand ratified the SDGs in 2015, thereby signalling its ongoing commitment to sustainable development both in New Zealand through domestic action, and internationally through leadership in global policy issues and development assistance. To date, the New Zealand government has been relatively slow to take action towards the SDGs. However, with the recent change in government in 2017, and especially the Labour-Green Confidence and Supply Agreement, the current political climate is more conducive to the implementation of the SDGs. Notably, the Confidence and Supply Agreement positions the SDGs as a priority for action (see Appendix A). These political changes have even greater saliency as the government prepares to report its progress on achieving the SDGS, scheduled for June 2019.

2.3 Review of NSCs for Tranche 2 funding

The examination of the role(s) the NSCs could play in giving effect to the SDGs in New Zealand has come at an opportune time. Funding for the second phase of the Challenges is subject to the results of the mid-way review in 2018. The National Science Challenges Performance Framework Guidance Document released by the MBIE in 2015 outlines the core performance areas and reporting requirements for the Challenges, including the general scope of the mid-way review (Ministry of Business, Innovation and Employment [MBIE], 2015a). The 2017 Terms of Reference clarify expectations regarding what is required (MBIE, 2017a). The review will consider the extent to which the Challenges are achieving their objectives and the aims of the NSC policy, and will extend to include an evaluation of the NSC policy to identify barriers and the opportunities to achieving the policy objectives of the NSC programme. In making their recommendation for funding, MBIE will also consider other factors that have emerged since the initial funding allocation. The outcomes of the reviews may affect the continuation of Challenges, the focus of Challenges, or the amount of funding for the Challenges (MBIE, 2017a).

The principles outlined in the mid-way review Terms of Reference (MBIE, 2017a) state the review will: look at the performance of each Challenge and the NSC policy as a whole, including cover past performance and look to the future.

The five-year strategy prepared by each Challenge must address how the Challenges will respond to national-scale issues and Challenge objectives in Phase 2 while ensuring research and science excellence. Delivering impact, collaboration, and supporting integrated research, where appropriate, are also key considerations, in addition to identifying new or modified research themes. Review outcomes and decisions will be delivered to the NSCs through July and August 2018.

2.4 Overarching research question

Our overarching research question to guide the work is below:

"*To what extent, and in what ways, are the missions and objectives of the National Science Challenges aligned to the outcomes sought from the UN SDGs, and how might knowledge generated by the Challenges support the attainment of the SDGs in New Zealand?"*

2.4.1 Sub-questions and work requested as part of the Think-Piece

The overarching research question was in turn broken into five sub-sections:

1. An outline of the SDGs that are in scope of Challenge science (especially the six listed above), or are out of scope.
2. Stocktake of New Zealand documented commitments to the SDGs
3. An outline of the relevant Challenge mission statements and thematic structures (or equivalent) and the research each Challenge conducts.

4. An assessment of alignment between the SDGs and each Challenge to be delivered as a matrix of SDGs versus Challenge-specific mission statements (or specific research). This section should also indicate the strength of alignment.
5. A research roadmap should address the following questions:
    - *What needs to happen to give effect to the goals?*
    - *Who should hold responsibility for the goals in a NZ context?*
    - *How might existing science inform and help measure progress towards the goals, recognising that measures of progress will vary widely across Challenges?*
    - *What, if any, gaps exist in the science portfolio and in implementation to achieve the goals after 2019?*
    - *What is the benefit of pan-Challenge collaboration?*
    - *What role might the Challenges play in advancing implementation?*

3. Work undertaken

Research included a selective literature review; survey based analysis; consultation with strategic advisors; an information gathering workshop; and qualitative case study development. The following sections outline these research outputs.

Project milestones and delivery dates are listed in Table 2 below:

Table 2. Project milestones and delivery dates

Meeting with Directors of National Science Challenges	27th Nov, 2017
Final Report framework	31st Dec, 2017
Literature Review	15th Jan, 2018
Think-Piece Initial Findings	30th Jan, 2018
Final Draft Think-Piece	28th Feb, 2018
Final Think-Piece (post review and revisions)	28th Mar, 2018

3.1 Workshop and engagement with NSC directors

In November, 2017, the Think-Piece writing team had the opportunity to meet with the Directors of the National Science Challenges for a ninety minute workshop. This provided the writing team with the opportunity to socialise the Think-Piece project and the SDGs more broadly, and to engage the Directors in an interactive exercise to identify which NSC goals, and in some cases indicators, most closely align with each of their Challenges (see Section 3.3). Nine of the eleven Challenge Directors were present, with the Resilience to Natures' Challenges Director providing a proxy.

3.2 Engagement with strategic advisors

The writing team have engaged with a wide number of strategic advisors using a snowball approach to determine people who would be useful to consult on the topic. Advisors were mostly consulted from academia and government, with some individuals from the private sector (see Table 3).

Table 3. Strategic advisors consulted with on the project (alphabetical order)

Professor Jonathan Boston	Professor of Public Policy, School of Government, Victoria University of Wellington
Associate Professor Ralph Chapman	Director of Environmental Studies graduate programme, Victoria University of Wellington
Dr. Vicki Compton	Principle Advisor, Science and Skills Team, Ministry for Primary Industries
Dr. Nicholas Cradock-Henry	Senior Researcher at Manaaki Whenua – Landcare Research
Sir Rob Fenwick	New Zealand environmentalist, businessman and professional Director
Dr. Richard Gordon	Chief Executive at Manaaki Whenua – Landcare Research
Stefan Gray	Senior Advisor – Research and Analysis, Parliamentary Commissioner for the Environment
Professor Girol Karacaoglu	Head of School of Government, Victoria University of Wellington
Dr. Bill Kaye-Blake	Director and Lead for Economics at PWC, Wellington
Tim Ng	Deputy Secretary and Chief Economic Adviser at New Zealand Treasury
Dr. Pedram Pirnia	Lecturer in Emergency and Disaster Management, Auckland University of Technology
Dr. Ann Smith	Chief Executive Officer, Enviro-Mark Solutions Limited
Associate Professor Marjan van den Belt	Assistant Vice-Chancellor of Sustainability, Victoria University of Wellington
Professor Iain White	Professor of Environmental Planning at the University of Waikato
Charlotte Wood	Analyst, Science Stewardship, Ministry for the Environment – Manatū Mō Te Taiao

3.3 Literature review

The writing team carried out a review of the state of play of engagement with the SDGs in New Zealand, the SDGs as applied over a range of countries globally, and the SDGs as applied in science and science systems internationally. A selective review was carried out to fit the scope of the Think-Piece.

3.4 Researcher assessment of NSCs and SDGs

As a way to begin discussion with the NSC Directors on where their Challenge might contribute to the SDGs, the writing team undertook a short exercise to examine where synergies may be present. The writing team examined each of the NSC vision, mission and objective statements in conjunction with the targets for each SDG. Each researcher indicated whether an NSC *might* meet a particular target under each of the SDGs. Some NSCs appeared as if they could meet most or all of the targets under an SDG. An example of this researcher assessment was circulated to the NSC Directors prior to a meeting in November 2017, where they were asked to conduct the same exercise thinking about their own NSC.

3.5 Case studies

Through consultation with the literature and conversations with Strategic Advisors and National Challenge Directors, the writing team established to need to demonstrate where synergies could be found between the existing science outputs of the NSCs and the SDGs. The writing team thought carefully on which Challenges to select. They decided to work with Sustainable Seas, Building Better Towns, Houses and Cities, and New Zealand Biological Heritage as these three Challenges represent a wide range of science, and are represented within the six Challenges self-identified as having particular interest in this project. Consideration was given to Mātauranga Māori and New Zealand Government responsibilities as Treaty Partners but no direct analogue was found amongst the SDGs.

4. Results

This section highlights the results of our research. It starts with a literature review summary that provides some history and framing of the SDGs, including details on their implementation and governance and the connections between science and the SDG Agenda. This review also indicates the state of play of SDG engagement in New Zealand. The full literature review is available in Appendix B. Additional results include researcher assessments of alignment of NSCs and SDGs, NSC Director assessments of these alignments, and our three case study examples where synergies could be found between the existing science outputs of the NSCs and the SDGs.

4.1 Literature review summary

One of the steps to producing this Think-Piece was a literature review (Appendix B). The review covered the following elements: science's contribution to the SDGs, a country comparison, and the state of play of the SDGs in New Zealand by 'sector'. Each of the sections is briefly summarised here. Science contributes to the SDGs in that science and research provides solutions to the many problems the SDGs hope to address. There are five key interventions from science towards the SDGs:

1. Devising metrics;
2. Establish monitoring mechanisms;
3. Evaluating progress;
4. Enhancing infrastructure; and
5. Standardising and verifying data.

The literature also highlights the need for multi/inter/trans disciplinary science that must go beyond academia to include a wide variety of stakeholders. The review also examines the UN Science, Technology and Innovation for SDGs, which has chosen several SDGs and is trialing technologies in a number of countries to help achieve them.

To look at the achievements in New Zealand in a broader context, we compared New Zealand to a number of comparable countries. According to Sachs et al. (2017), using their SDG index and dashboard, New Zealand is ranked as 30th globally in achieving the SDGs. This is in comparison to Finland (3rd), Australia (26th), Canada (17th), Germany (6th) and the United Kingdom (16th). We

note that different countries achieve different goals at different rates due to their national circumstances, including institutional and governance arrangements.

With respect to what the state of play on the SDGs in New Zealand, there is very little public information available. Government departments have very little, if any, information on the SDGs. Treasury, Ministry for Social Development and Statistics New Zealand have no information. The Ministry of Foreign Affairs and Trade signed New Zealand up to the SDGs, and works to contribute to them through the New Zealand aid and development budget. The Ministry for Primary Industries is generally involved in combatting climate change and sustainable agriculture in pursuit of achieving the SDGs. In response to an Official Information Act request, the Treasury states that they support the government's role in reducing disadvantage for children.

New Zealand businesses and industry peak bodies have very little public information on their work towards the SDGs. Several large New Zealand businesses such as, Z Energy, Vector and Air New Zealand have aligned their business goals to a variety of the SDGs.

New Zealand universities and research organisations have more information about their work towards New Zealand's achievement of the SDGs. Most New Zealand Crown Research Institutes do not explicitly link their work to the SDGs (with the exception of Scion and NIWA); however, all are conducting research to help New Zealand achieve them. Several New Zealand universities (Otago, Victoria, Auckland and AUT) have put in place programmes and projects to help them work towards the SDGs.

Multiple New Zealand civil society organisations are working towards achieving SDGs in their particular spheres of interest.

4.2 What the NSC Directors told us

During a pan-NSC Directors meeting in November 2017, the directors present (or their proxies) were asked to indicate which SDGs they felt their Challenge science was or could be contributing to. They were also asked to indicate how strongly they felt their Challenge was aligned with any of the SDGs. Some directors also indicated specific targets they felt their Challenge was able to deliver to, while others did not go into this level of detail. Unfortunately, at this November meeting three directors were unable to attend, and were subsequently asked to complete the exercise via a short online survey. One of the three absent directors completed the survey.

In all cases where a director or their proxy participated in the assessment exercise, there was at least one point of alignment found between each NSC and the SDGs. Many of the directors felt their Challenges contributed to goal 8, economic growth, as well as goal 12, sustainable production and consumption. Some goals, including goal 5, reducing gender inequality and goal 10, reducing inequality were seen to only lightly relate to one or two NSCs.

The results of the second task are illustrated in Figure 1 below. The Directors were asked to subjectively determine the strength of their NSC's alignment to any of the SDGs. Highlighting the relationships between the key NSCs in section 1a, the Sustainable Seas director found a fairly strong

relationship between their NSC and goal 14, life under the oceans. Our Land and Water's director felt there were strong relationships between the Challenge and goal 12, sustainable consumption and production, while the director of New Zealand's Biological Heritage found strong relationships between their Challenge and goal 6, water and sanitation and goal 15, life on land. The proxy for the Resilience to Nature's Challenges' director found strong relationships between the Challenge and goals 9, 11 and 13, infrastructure, cities and climate change.

The directors of the Better Homes, Towns and Cities and Science for Technological Innovation Challenges did not indicate any strong synergies between their Challenges and any of the SDGs; however, they did identify multiple SDGs that aligned with their Challenges. The director of New Zealand's Biological Heritage noted that, with potential changes in scope to this Challenge in the next phase, the Challenge may also have some synergies with goal 14, life under the oceans.

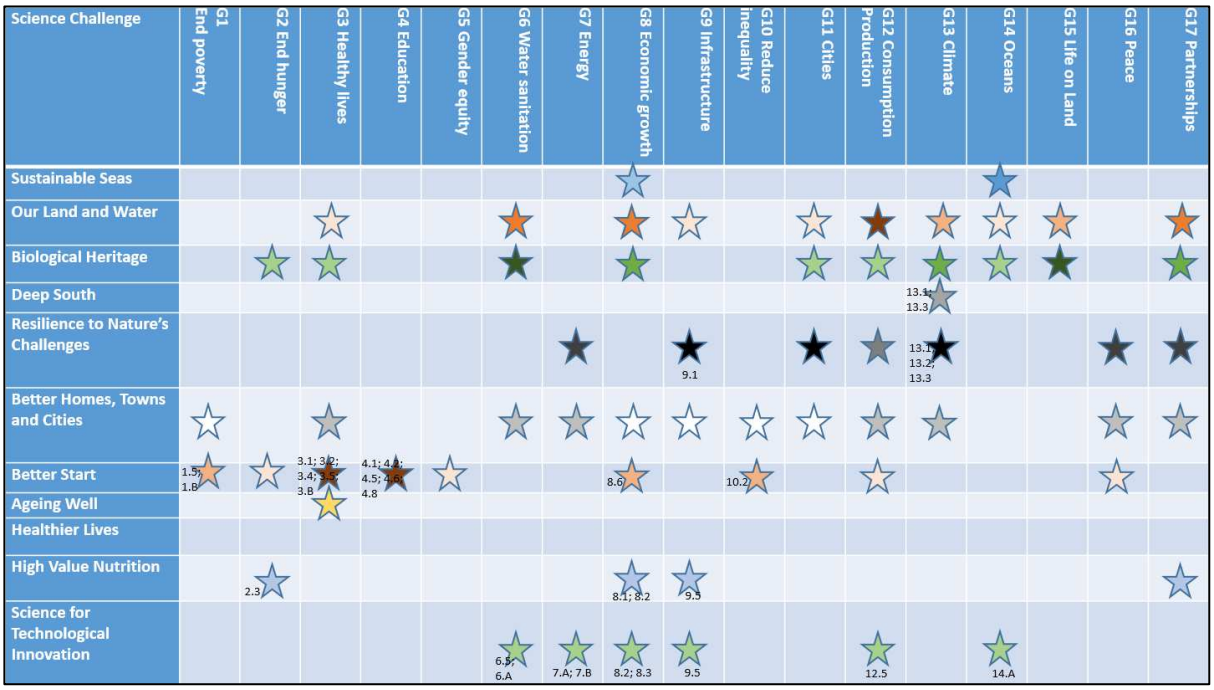


Figure 1. Matrix of alignment of NSCs and SDGs, as seen by the directors of the NSCs, including targets, where applicable, along with the perceived strength of the relationship. Strength of the relationship is shown by the colour gradient: light colours indicate that the directors felt there was weak alignment, while dark colours indicate strong alignment.

4.3 Researcher assessments

In conducting our own assessment of where the NSCs and SDGs may have synergies, we have developed our own answers to two of the research tasks. The first task, "*An outline of the SDGs that are in scope of Challenge science (especially the six listed above), or are out of scope*", found that all NSCs had some connection to at least one SDG. Some SDGs, like goal 8, Economic Growth, cut across all of the NSCs, as well as goal 17, Partnerships. Some goals, for example, goal 16, Peace and Security and goal 5, reduce gender inequality, and goal 1, End Poverty were only found to lightly correspond to one NSC.

The second task undertaken in the researcher assessment, "*An assessment of alignment between the SDGs and each Challenge to be delivered as a matrix of SGSs versus Challenge-specific mission statements (or specific research). This section should also indicate the strength of alignment*", delivered partial results shown in Figure 2. The strength of the alignment was subjectively determined through the number of researchers agreeing that a particular NSC met targets within an SDG and the number of targets that the NSC might potentially deliver to.

Highlighting the strong relationships between the six Challenges listed in section 1a, the Sustainable Seas NSC was perceived to deliver strongly against goals 8 and 14, economic growth and life under the oceans. The Our Land and Water NSC could deliver strongly against goals 8 and 12, economic growth and sustainable consumption and production, while New Zealand's Biological Heritage delivered strongly against goals 6 and 15, water and sanitation and life on land. Resilience to Nature's Challenges was seen as delivering strongly against climate change, with Better Homes, Towns and Cities delivering strongly against goals 7 and 11, sustainable energy and cities. Science for Technological Innovation was not perceived as delivering to any SDGs as strongly as the others.

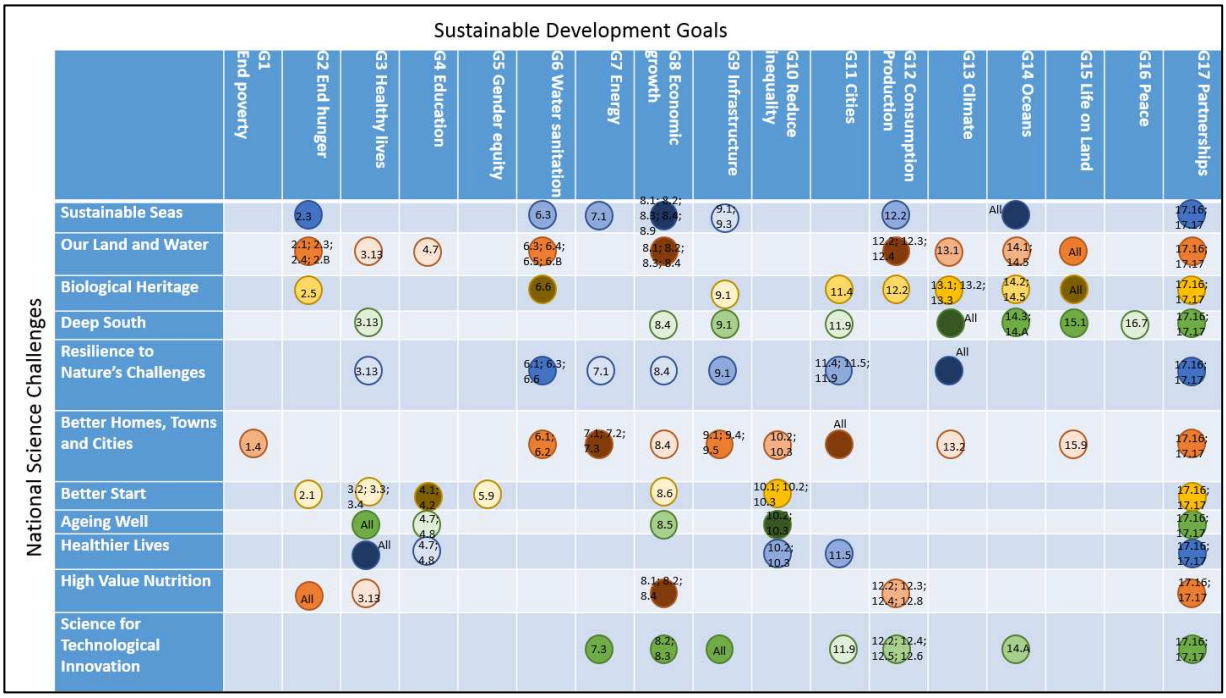


Figure 2. Matrix of alignment of NSCs and SDGs, as seen by the writing team including targets, where applicable, along with the perceived strength of the relationship. Strength of the relationship is shown by the colour gradient: light colours indicate where the writing team felt there was weak alignment, while dark colours indicate strong alignment.

These data presented in Figures 1 and 2 are combined in Figure 3 below to indicate strength of overlap between the Directors and the writing team for alignment of NSCs and SDGs. Ninety six of the 143 total connections are made in agreement between both groups. There are 34 matches that contain at least a medium and a strong connection, and 11 of these are matches between two strong connections. The largest number of paired connections can be found in Better Homes, Towns and Cities (9), followed by New Zealand's Biological Heritage and Our Land and Water (both 8). Better Start comes in with 6 paired connections, and Resilience to Nature's Challenges and Science for Technological Innovation both have 5 pairs each. One can also examine which SDGs have the

greatest number of connections. SDG17 (Partnerships) and SDG8 (Economic growth) both have 16 connections. SDG3 (Healthy lives) has 12, SDG12 (Consumption and production) and SDG9 (Infrastructure) both have 11 connections.

The alignment of specific research within each of the Challenges to SDGs was not assessed across all Challenges. However, three case-studies examining research projects and their alignment to the SDGs were prepared, and are presented in the following sections.

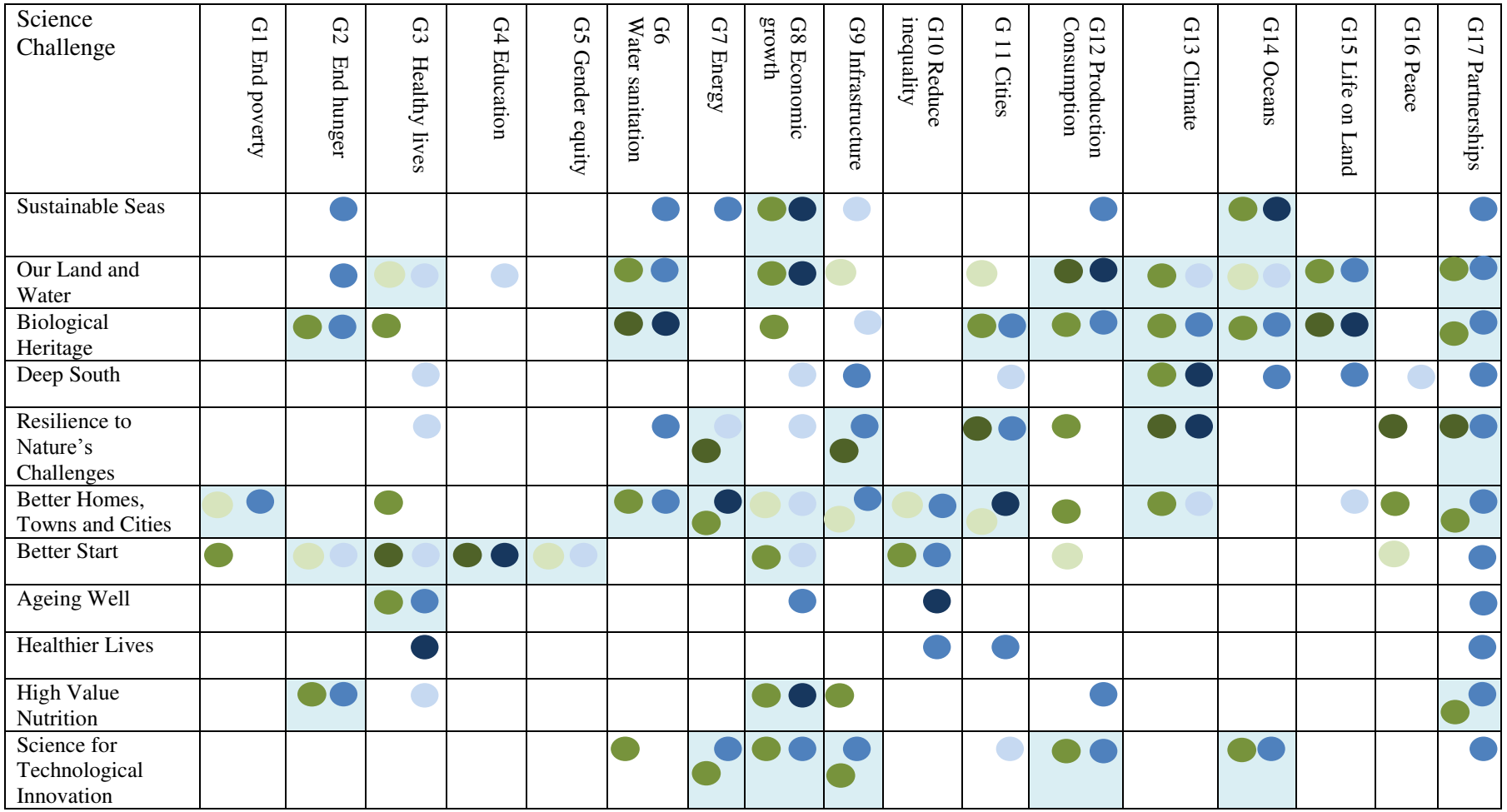


Figure 3. Combination of Directors and Reviewers identified links between SDGs and NSCs. Researchers: Blue (light, medium, and dark indicate strength of link), Directors: Green (light, medium, and dark indicate strength of link). Teal coloured shading of cell to highlight agreement between Researchers and Directors.

4.4 Case Studies

The three case studies presented below explore SDG goals and targets that align with three selected National Science Challenges. Sustainable Seas; Building Better Homes, Towns and Cities; and New Zealand's Biological Heritage were selected as the these Challenges expressed interest, and represent three of the six Challenges self-identified as having particular interest in this Think-Piece project. The rationale of this case study exercise is to map out where the NSC research programmes can establish synergies with the SDG Agenda. The writing team considered the exercise a valuable first step in determining where links might be best established.

4.4.1 Sustainable Seas

Sustainable Seas is organised into seven research programmes with 40 projects sitting underneath. The programmes and research focus is outlined below:

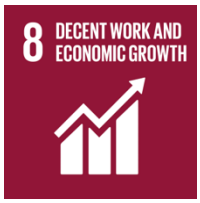
- Our Seas: Developing ways to enhance engagement and participation across all sectors of society, resulting in more efficient and effective decision-making using EBM.
- Valuable Seas: Developing ways to incorporate economic, social, environmental, spiritual and cultural marine values in decision-making, and identifying innovative ways to add value to the marine economy.
- Tangaroa: Developing innovations that enable Māori to participate as partners in marine management, provide for the practice of *tikanga*/Māori custom, and support economic growth.
- Dynamic Seas: Using biophysical science to investigate how ecosystems work, are connected and how they respond to change; and providing an evidence-base for effective EBM.
- Managed Seas: Using the knowledge generated by the Challenge to develop innovative and effective tools that support decision-makers and enable EBM.
- Vision Mātauranga: Working with Māori to capture the needs and aspirations of all sectors of society, and unlock the potential of Māori knowledge, resources and people.
- Cross-programme: Understanding current frameworks under which decision making is made within New Zealand's marine estate, and trialling EBM.

Relevant goals:

- SDG8: Decent work and economic growth.
- SDG14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development.

Targets:

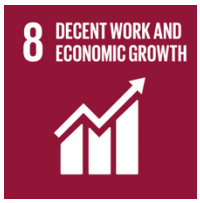
SSNSC does not directly meet any of the targets under SDG 8 or SDG14. The focus on EBM and its implementation in NZ implicitly addresses a number of the targets that sit under both of these goals. Within SSNSC, EBM is conceptualised as a holistic and inclusive way to manage marine environments, and the competing uses for, demands on, and ways New Zealanders value them.



Target 8.1– *Sustain per capita economic growth in accordance with national circumstances and, in particular, at least 7 per cent gross domestic product growth per annum in the least developed countries.*

Successful implementation of EBM will enhance the sustainability of New Zealand's marine resources and add value to the marine economy through a variety of pathways.

Research Programmes/Projects
Our Seas ("Frameworks for achieving and maintaining social licence to operate"), Valuable Seas ("Creating value from a blue economy"), Tangaroa.



Target 8.2–*Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors.*

Creating economic value from marine resources requires public acceptance of commercial operations especially for new activities. Building a blue economy is underpinned by economic innovation and diversification of economic activities to enable communities to flourish and enhance the capabilities of local people to work with the resources.

Research Programmes/Projects
Our Seas ("Frameworks for achieving and maintaining social licence to operate"), Valuable Seas ("Creating value from a blue economy"), Tangaroa.

Target 14.1–*By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution*.

Marine pollution would reduce if there were changes in planning and legislation to regulate land use activities. Taking a more holistic ki uta ki *tai* (mountains to sea) approach draws attention to the connections between land and sea. Effective EBM necessitates understanding how ecosystems function and respond to human disturbances including ecosystem connectivity.

Research Programmes/Projects
Dynamic Seas ("Ecosystem Connectivity: Tracking biochemical fluxes to inform Ecosystem Based Management ", "Tipping Points in ecosystem structure, function and services", "Stressor

footprints and dynamics"), Our Seas ("Navigating marine social-ecological systems", "Navigating the implementation impasse: enabling interagency collaboration on cumulative effects" (Innovation Fund)), and Cross Programme.

Target 14.2 *– By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans.*

Research on cumulative effects and tipping points contribute to strengthening resilience and restoration as does a focus on ecosystem connectivity.

Research programmes/Projects
Dynamic Seas (("Ecosystem Connectivity: Tracking biochemical fluxes to inform Ecosystem Based Management ", "Tipping Points in ecosystem structure, function and services") and Our Seas ("Navigating marine social-ecological systems" and "Navigating the implementation impasse: enabling interagency collaboration on cumulative effects" (Innovation Fund)).

Target 14.3 *– Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels.*

Research focused on proof-of-concept test of the potential of two remediation techniques - return of waste shell and aeration – to mitigate the impacts of low pH in mussel farms.

Research programmes/Projects
Valuable Seas ("A feasibility study of coastal acidification mitigation strategies for the mussel industry" (Innovation Fund)).

Target 14.4 *– By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics.*

Sustainable Seas takes a holistic approach to consider a broader suite of marine-based activities than just fishing. The assumption is that an EBM approach would address these problems with fisheries within NZ's EEZ.

Research programmes/Projects
Not an explicit focus but research findings from the following programmes may have relevance: Our Seas, Dynamic Seas, Valuable Seas, Tangaroa, Managed Seas and Cross Programme.

Target 14.5 *– By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information*

Conservation is not an explicit focus of Sustainable Seas beyond its importance to ensuring the utilisation of marine resources within biological and ecological limits.

Research programmes/Projects
Not an explicit focus but research findings from the following programmes may have relevance: Valuable Seas, Tangaroa, Dynamic Seas.

Target 14.c *– Enhance the conservation and sustainable use of oceans and their resources by implementing international law as reflected in UNCLOS, which provides the legal framework for the conservation and sustainable use of oceans and their resources, as recalled in paragraph 158 of The Future We Want.*

While there is recognition of obligations and responsibilities under UNCLOS within NZ's territorial seas, the focus of SSNSC extends to EEZ/continental shelf but it is recognised that effects/implications extend beyond these boundaries.

Research programmes/Projects
Not an explicit focus but research findings from the following programmes may have relevance: Our Seas (Navigating Marine Social-Ecological Systems, Navigating the implementation impasse: enabling interagency collaboration on cumulative effects (Innovation Fund)), Cross-Programme.

4.4.2 Building Better Homes, Towns and Cities (BBHTC)

The Building Better Homes, Towns and Cities Challenge (BBHTC) seeks innovative, affordable, and flexible solutions for our homes, towns, and cities. This will enable the Challenge to create residential environments that suit the needs of New Zealand's multi-cultural society. Included among these are effects of accelerating climate change and dynamic population shift. Research outcomes will support New Zealanders to embrace change and to understand what sustainable and effective land-use means for our 21st century lives. The Challenge is divided into six themes, the first three focus on the different scales of our built environment. The six BBHTC themes are outlined below:

- BBHTC 1. *Kainga tahi kainga rua* (Individual Home scale): improve quality of housing and make it affordable

- BBHTC 2. Shaping Places (Neighbourhood scale):
- BBHTC 3. Supporting Regional Settlements (Regional scale):
- BBHTC 4. Next-Generation Information
- BBHTC 5. Transforming the Building Industry
- BBHTC 6. Improving the architecture of decision making

Target 11.1 *– By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums.*

Work carried out under BBHTC 1 directly addresses target 11.1. The Challenge acknowledges that a large part of the New Zealand housing stock suffers from cold and damp indoor conditions, which has impacts on the occupants' health. Furthermore, housing affordability has dropped significantly over the last 50 years (Saville-Smith, BUILD Iss.163, pp.56-58). The initial focus of the Challenge has been on producing robust data illustrating these historical developments and providing an accurate depiction of the present situation and the current state of industry knowledge. Engagement with the construction sector has yielded valuable information on how to make buildings more affordable. One example is that prefabricated buildings or building elements have the potential to reduce housing costs in the future. BBHTC 6 looks closely at the cost of land and how building and consenting costs impact on new-build housing costs. BBHTC initiatives are strongly reliant on a cross-sector approach that works with academia, local regulatory authorities and the industrial sector.

Target 13.1 *– Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries.*

Mainly a "Resilience to Nature's Challenges" project, but with links to BBHTC, this research directly addresses SDG target 13.1 and focusses on 'managed retreat'. The study acknowledges the importance of designing with, rather than against, nature and explores the extent to which New Zealand is prepared for a "strategic, coordinated relocation of assets away from natural hazard risks" (Hanna et al., BUILD Iss.163, pp.62-64). The study's analysis of documents from regional councils and local authorities highlights numerous inconsistencies and barriers to developing an effective strategy for 'managed retreat' from hazard zones, in New Zealand. The experience gained from this study could also help other countries, especially within the Pacific Region.

Target 11.2 *– By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons.*

Projects under NSC11.b and NSC11.c explore issues beyond the individual home. It is increasingly recognised that both the physical and social structure of neighbourhoods are critical to their success (Berry, 2017). NSC 11 acknowledges that built environments need to build communities. Therefore, the vision (*Ka ora kainga rua*) is to transform individual dwellings into homes and communities that are hospitable, productive and protective. A flexible and inclusive transport system catering for all is an integral part of such a community. A related BBHTC project looks at the impact of autonomous vehicles and how they might change settlement characteristics in an ageing society.

Target 11.8 *– Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning.*

A new BBHTC project is investigating rural and small towns in New Zealand and how they contribute to the national economy. Emphasis is placed on the challenges these regions face and whether they are able to respond to social and economic change. Case studies will highlight local development challenges and opportunities. Findings will be used to guide policy makers and stakeholders.

Target 9.5 *– Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending.*

Target 5.5 *– Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic and public life.*

Target 11.1 *– By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums.*

Research carried out under BBHTC 5 *Transforming the building industry* works at the peripheries of these two SDG targets as well as target 11.1 striving for affordable houses. NSC projects have established several focus groups to establish what the future of the building industry will look like and what is needed to accomplish this. For example, high-tech & innovative off-site production techniques of whole houses or house segments have the potential to bring down housing costs, establish a high-tech industry sector and attract women into a traditionally male-dominated construction sector.

4.4.3 New Zealand Biological Heritage (NZBH)

New Zealand's Biological Heritage National Science Challenge has provided the following information regarding the alignment of NZBH to the following Sustainable Development Goals:

> *New Zealanders value highly our biological heritage – the natural, production and urban environments in which we live, work and recreate. These environments underpin our economy through primary industries and tourism, are integral to our sense of national identity, and have important cultural and recreational significance. However, elements of our environment are under increasing pressure. Our Challenge's science will transform the way we respond to that pressure. Our aim is to protect and manage our native biodiversity, improve our biosecurity, and enhance our ecosystem resilience to global threats and pressures.*

The NZBH Challenge has 5 Impacts:

1. Protect and restore: secure threatened species and resilient ecosystems
2. Eliminate threats: weeds, pests, mammal predators, and pathogens
3. Detect and eradicate: zero impacts from biosecurity incursions
4. Restore healthy freshwater: wai taonga and mahinga kai
5. Track our progress: a bioheritage scorecard for Aotearoa

NZBH funds 18 research projects in addition to smaller, targeted seed funding initiatives. Research projects often contribute to more than one Impact.

Although NZBH does not directly meet any of the SDG goals, linkages can be made between SDG targets and NZBH Impacts. Outlined below are research projects that contribute to specific targets. Note, examples provided do not cover all research the NZBH is currently doing within a particular target area.

Target 2.5 *– By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed*

NZBH 2 - Eliminate threats: weeds, pests, mammal predators, and pathogen
Resilience of natural and production ecosystems to new and existing pests, weeds and pathogen threats is enhanced.
Research programmes/projects
Seed banking against extinction of taonga plants (Seed funding only)

Target 6.6 *– By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.*

NZBH IMPACT 4: Restore healthy freshwater: wai taonga and mahinga kai

The wellbeing of current and future generations is enhanced through the use of contemporary science, Mātauranga Māori, and local knowledge to inform management decisions.

Research programmes/projects

Biosecurity threats to freshwater taonga invertebrates. The research aims to reduce biodiversity threats by integrating contemporary science with hapū and iwi knowledge.

Target 11.4 *– Strengthen efforts to protect and safeguard the world's cultural and natural heritage*

NZBH IMPACT 1: Protect and Restore

The diversity of New Zealand's natural and cultural heritage is restored and maintained. Iwi, hapū, and whanau are enabled to give effect to kaitiakitanga.

Research programmes/projects

Customary approaches to ecosystem resilience. Engaging with Māori customary approaches and practises contribute to protecting and restoring ecosystem resilience, where humans are an integral part of that ecosystem.

NZBH IMPACT 5: Track our Progress

New Zealanders value and are inspired and enabled to actively enhance and sustainably manage our shared natural and cultural heritage.

Research programmes/projects

Mātauranga Māori for Biological Heritage. Co-developing a methodology between Mātauranga Māori holders and potential users to reverse the decline of New Zealand's biological heritage.

Target 12.2 *– By 2030, achieve the sustainable management and efficient use of natural resources.*

NZBH IMPACT 1: Protect and Restore

We aim to secure threatened species and resilient ecosystems.

Research programmes/projects
Enhancing native biodiversity in agroecosystems; and, adaptive evolution of native biota, with a focus on increasing the resilience of both threatened taonga and mahinga kai species.

Target 13.1 *– Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries*

NZBH IMPACT 1: Protect and Restore
New Zealand's natural and production ecosystems are resilient to global change.
Research programmes/projects
Climate change impacts on New Zealand's biological heritage. Establishing a framework for evaluating the impacts of climate change on New Zealand's biodiversity, biosecurity, and ecosystem processes. (Seed funding only)

Target 15.1 *– By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements*

NZBH IMPACT 1: Protect and Restore
The diversity of New Zealand's natural and cultural heritage is restored and maintained.
Native plants and animals flourish across a network of protected places, including in production landscapes through enhanced connectivity among remnant native taxa, habitats and ecosystems.
Research programmes/projects
Ecosystem tipping points. This project detects ecosystem improvement, reversing degradation, and preventing harmful self-reinforcing changes in ecosystems.

NZBH IMPACT 3: Detect and Eradicate
Zero impacts from biosecurity incursion.
Research programmes/projects
Biosecurity networks. The research focuses on the human-assisted networks that may play a role in the spread of pests, weeds, and pathogens.

NZBH IMPACT 4: Restore healthy freshwater
Measures of ecosystem resilience are monitored, trajectories understood and tipping points anticipated and measured.
Research programmes/projects
Food webs and stream restoration.

Target 15.2 *– By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally.*

NZBH IMPACT 2: Eliminate threats: weeds, pests, mammal predators, and pathogens
System wide responsiveness to changes in risks from pests, weeds, and pathogen threats is improved.
Research programmes/projects
Citizens combating kauri dieback, collaboration between social and biophysical scientists, community leaders, Iwi/hapū and landowners; Stopping kauri dieback; and, Māori biosecurity solutions (Myrtle rust).

This is another target that aligns indirectly to a number of our Impacts and research projects. Some examples are below.

NZBH IMPACT 1: Protect and Restore
Restore threatened species and ecosystems, including taonga species, across landscapes.
Research programmes/projects
Customary approaches to ecosystem resilience, where humans are an integral part of that ecosystem.

NZBH IMPACT 2: Eliminate threats: weeds, pests, mammal predators, and pathogens
New technologies and practices for achieving more cost-effective, humane and sustainable control or eradication of existing threats are in use.
Research programmes/projects
Novel predator control technologies; social licence for pest control; stopping Kauri dieback; biosecurity threats to freshwater taonga invertebrates; and, seed Banking.

NZBH IMPACT 3: Detect and eradicate: zero impacts from biosecurity incursions
Prevent biosecurity invasions and mitigate damage to indigenous and managed ecosystems at landscape scale.
Research programmes/projects
Biosecurity networks; and, genomics and metagenomics for pathogen risks. Applying pathogen genomics and ecosystem metagenomics to address biosecurity questions across productive and natural estates.

Target 15.6 *– Promote fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources, as internationally agreed*

NZBH IMPACT 5: Track our Progress

The integration of nationally-consistent eDNA methodologies with existing monitoring programmes will deliver a step change in biodiversity assessment.

Research programmes/projects

A national framework for biological heritage assessment across natural and production landscapes using eDNA data to address questions on ecological function, biosecurity and biodiversity conservation at the New Zealand-wide scale.

Target 15.8 – *By 2020, introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species.*

IMPACT 3: Detect and eradicate: zero impacts from biosecurity incursions

Prevent biosecurity invasions and mitigate damage to indigenous and managed ecosystems at landscape scale.

Research programmes/projects

Biosecurity networks; citizens combating kauri dieback; Māori biosecurity solutions; genomics and metagenomics for pathogen risks; and, citizen based biosecurity surveillance.

NZBH IMPACT 2: Eliminate threats: weeds, pests, mammal predators, and pathogens.

New technologies and practices for achieving more cost-effective, humane and sustainable control or eradication of existing threats are in use.

Research programmes/projects

New technologies and practices for achieving more cost-effective, humane and sustainable control or eradication of existing threats are in use.

NZBH also helped with the science strategy for Predator-Free 2050 launched by the Government in 2016 to rid New Zealand of our most damaging introduced predators – possums, rats and stoats.

5. Research roadmap recommendations

The following questions were suggested in the project guidelines (RFP) to inform a research roadmap. The responses provided are a summary of the thoughts and options of the writing team and the consulted strategic advisors to the Think-Piece, based on the evidence obtained during this research. While we provide some general guidance, we focus on framing this advice through the NSCs and the New Zealand science 'sector'.

1. *What needs to happen to give effect to the goals?*

The focus here is on giving effect to the goals in New Zealand. The question is far reaching. However, there are some general guidelines that can be suggested.

We require leadership and direction from central government. A clear lead agency that is responsible for reporting and collating the data for reporting should also be put in place. This direction from government should ideally present itself in the form of a Cabinet Paper with clear recommendations, including a lead government department, the SDG targets and indicators relevant to New Zealand should be outlined, and an implementation and monitoring strategy should be provided with associated programmes of work. Additionally, details of how each of the following broad 'sectors' – research/science, civil society, government and industry – can contribute to the SDGs and New Zealand priorities should be included.

As many of the goals cross agency boundaries (in New Zealand), this means that achieving meaningful accountability could be quite costly in a bureaucratic sense. This may explain why most countries appear to have located the responsibility within the Department of the Prime Minister and Cabinet (DPMC) or equivalent (e.g. Finland, Germany), which sits at the sharp end of the policy prioritisation and coherence process, with support from the foreign affairs or foreign aid agency given the external relations component. What would perhaps help is a more coherent way of aligning the goals with national policy priorities as stated by the government, so there is a single domestic priority-formation framework that drives the policy decisions promoting progress towards the goals. In practice in New Zealand, choices about how to report the New Zealand indicators to illuminate progress against the goals probably would drive the question of which agencies are responsible (for example, as the Think-Piece notes, a reporting apparatus for environment-related goals already exists). Thus reporting choices probably explains the role of the national statistics agencies in many of the arrangements we see overseas.

Guidance from central Government on what it sees as priorities and approach for SDG implementation and reporting will help narrow the scope and provide direction for research and science that will support New Zealand's objectives. The Government is currently developing its wellbeing policy priorities (across economic, environment and social sectors) as well as a framework for measuring New Zealand's progress, which aligns with the goals of the SDGs. This information will help provide clarity on policy direction, with the SDGs providing the long-term objectives. Identifying the linkages between the Government's current priorities and the SDGs will highlight the research needed to help New Zealand give effect to the goals.

As a next step, once the Government has released information about its wellbeing policies, it would be useful to review the NSCs against both the new Government's policy priorities and the SDGs most relevant to these. This would help inform a conversation about how NSCs are placed to support progress toward achieving the SDGs. The NSC Tranche two funding reviews could consider including research components directly linking with the SDGs in their programmes of research. One of the contributions that the scientific community can make is to help to identify the indicators, and associated data, that are best suited to measure and monitor progress against the targets set for each of the 17 SDGs.

A second major contribution the scientific and academic communities can make is to direct their research towards helping with the prioritisation of policies aimed at attaining the SDGs. To that end, what is critical is the identification of the interdependencies between these goals – which investment(s) would yield the "biggest bang for the buck" (i.e. if I had $1 to invest, where should I

invest it). By way of example, and for obvious reasons, a focus on ending poverty (Goal 1) would have positive benefits for most of the social, economics, and environmental goals.

Because countries have the opportunity to prioritise their efforts, there are opportunities to be distinctive. What could NZ confront and where could it have impact? For example, there is research at present focused on doing economy differently, and the different kinds of social and environmental outcomes that follow. This is an example of a distinctive NZ approach to economy. It is worth giving some thought to how post-Treaty settlement realities in NZ are reconfiguring investment and research trajectories as Māori become significant investors and actors across a range of different domains. How does this influence the way science is done now and in the future? What will be funded? How might this influence identification of priorities? How will research be designed and performed? For example, the VM policy and inclusion of mātauranga within the Challenges requires a shift in science practice in NZ and re-consideration of what counts as knowledge as well as the processes through which knowledge is produced.

We need to identify and use appropriate data (Table 4), have clear reporting guidelines, and place more resources into socialising the process of working towards the SDGs by making the data and information more widely available, for example. Work carried out towards achieving the SDGs is something to be celebrated and promoted.

As the OECD highlighted in its report on UN SDGs, and their mapping against the OECD's How's Life (Better Life Index; BLI) indicators, the ultimate objective is to protect (and, even better, enhance) intergenerational wellbeing (OECD, 2017). The OECD BLI domains are about wellbeing-related outcomes, whereas the UN SDGs are about the prescriptions that need to be followed to achieve these outcomes. We know, from various studies, that wellbeing is multi-dimensional, and no subset of wellbeing domains, or UN SDGs, will suffice to progress wellbeing sustainably, if pursued on their own. In other words, we need to make sure that we are making progress across all 17 of the UN SDGs. To that end, we need to find suitable and adequate sets of indicators for all SDGs, and monitor and broadcast progress across all of these – not just a subset. Victoria University's School of Government (SoG) is working with Statistics New Zealand data to match their data and indicators with SDG targets and indicators – and, when suitable data is not available, to encourage Statistics New Zealand to collect such data. They are planning to make this information available, along with SDG relevant data from a wide variety of sources, on an online accessible portal.

Table 4. Ideal data characteristics (source: Environmental Scientist, 2017)

Consistent	Monitoring over the 15-year time span of the SDGs
Trustworthy	Reliable recording and reporting of data
Transboundary	Data from national to basin scale
Transparent	The weaknesses and strengths of methodologies are identified
Verifiable	The information can be traced to its origin
Feasible	The data can be recorded in a practical and realistic way
Pragmatic	The collected data and methodology used for the indicators can be used for strategy planning, awareness raising, risk assessment and the development of policies
History	Long-term trend analysis, for example, in climate change
Sustainable	Open and free operational data

2. *Who should hold responsibility for the goals in a NZ context?*

Who should hold responsibility for the goals is an open question. Arguably, it could be useful if the agency in charge of reporting on the goals also had the mandate to implement them, and a sufficient budget allotted to them that is commensurate with the task. This links through to the discussion on Government leadership in the previous question.

While Government will need to provide overarching guidance about New Zealand's ambition and priorities for implementing the SDGs, leadership will appear from a range of players. It will be useful for the NSCs to be aware of who these leaders are when they're defining the role of science and research in supporting New Zealand's actions as there might be opportunities in bringing together the actions of government and non-government leaders.

As Government has the responsibility for producing New Zealand's official reporting to the UN, there is an interagency working group (which includes Statistics New Zealand) that will coordinate New Zealand's reporting. However, it must be noted that its effectiveness has been curtailed due to staff turnover and a lack of leadership on the SDG Agenda. The UN does not have a set format for reporting, which enables countries to have some flexibility in what they include in their reports, which might include information from non-government sources or could utilise data from NSC research.

To most effectively progress towards achieving the SDGs, responsibility will need to be dispersed across all of New Zealand (CRIs, government, universities, NGOs, industry, communities etc.). The National Science Challenges have a strong potential role to play. The strength of the Challenges is their collaborative, interdisciplinary, integrated approach to science and research, and their focus on complicated problems that transcend a single domain (i.e. social, economic, ecological, and cultural). The National Science Challenge emphasis is a best teams approach and to an extent, the capabilities and capacities of New Zealand scientists to work collaboratively has been built in Phase 1, and developed further in Phase 2, to train the next generation of scientists. Given that the NSCs are cross-disciplinary and mission-led by nature, they are well placed to play a role in reflecting the efforts of a broad range of stakeholders and their complementary efforts towards achieving the SDGs. Specifically including the SDGs in Challenge missions would help galvanise this process.

3. *How might existing science inform and help measure progress towards the goals, recognising that measures of progress will vary widely across Challenges?*

The case study examples provided in this report provide a basis for establishing how existing science outputs from the NSCs can help to inform and measure progress towards the goals. A logical next step would be to determine how the agencies tasked with reporting on the goals can use these science outputs in the reporting. The considerations in Table 4 will need to be addressed, as well as determining if the science generated is a fit for purpose match with a specific SDG indicator and target.

As outlined above, the UN does not have a set format for how countries should report on their progress implementing the SDGs. Therefore, New Zealand will need to decide what information it

wants to present to describe the country's progress on implementing the SDGs (not all targets are equally relevant to all countries). The work that Statistics New Zealand is leading to develop a framework for measuring New Zealand's progress will provide some information about which indicators (including some SDG indicators) will be most relevant for New Zealand. This will help inform what science could contribute to telling the story of New Zealand's progress with the SDGs.

Crucial to utilising existing information will be data access and interoperability – two issues that the science system have recognised are weaknesses and need addressing for better understanding our natural assets. There is growing momentum in the science system to address this in a collaborative way, and Government is interested in how the NSCs are working across Challenges and their host organizations/Challenge partners to allow for a systems-based utilisation of information produced.

4. *What, if any, gaps exist in the science portfolio and in implementation to achieve the goals after 2019?*

All 17 Goals are represented across the 11 NSCs as documented in the report by the matrix of alignment of NSCs and SDGs, and as identified by the writing team and Challenge Directors. However, some goals link much more strongly than others. SDG8 (Economic Growth) and SDG17 (Partnerships) have the strongest representation. SDG5 (Reduce Gender Inequality) and SDG10 (Reduce Inequality) had the weakest associations with the NSCs.

As documented in the literature review (Appendix B), many of New Zealand's Crown Research Institutes are carrying out work around the SDGs. However, outside of NIWA and Scion, there is virtually nothing publically available about this research. There is no mention of the SDGs in the National Statement of Science Investment (NSSI) (MBIE, 2015b), (although this is undergoing a review by the new government), the Strategic Science Investment Funds (SSIF) investment plan (MBIE, 2017b), nor the Conservation and Environment Science Roadmap (MfE, 2017). Interestingly, there is only one mention of SDGs in the Primary Sector Science Roadmap (MPI, 2017) around future research actions:

"Linking local and national products and practices to national and international indicators around multiple dimensions of wellbeing for NZ, social progress indicators and SDG indicators"

Page 16, Primary Sector Science Roadmap

This coverage represents a significant gap in the science portfolios with respect to the SDGs.

Land science is a major gap for progressing toward all the environmental-related goals. The upcoming state of the environment report *Our Land 2018* (April 19 release) will provide a good overview of where gaps lie in regards to soils/land use/waste/biodiversity etc. Given that the land domain is the nexus of pressures on the wider environmental system, a better understanding of our land environment will be crucial for the success of an evidence-based approach to achieving the environmental SDGs. Information from previous reports under the environmental reporting progress, responses by the Parliamentary Commissioner for the Environment (PCE, 2016), and the

OECD's Environmental Performance Review 2017 (OECD, 2017) may also be useful in identifying gaps in data.

5. What is the benefit of pan-Challenge collaboration?

One of the exiting components of the SDGs is the opportunity for pan-Challenge collaboration. Further pan-Challenge collaboration, using the SDGs, for example, as a focal point, could potentially increase the strength of pan-Challenge working relationships, associated transfer of knowledge, and lead to an increase in interdisciplinary research outcomes. The interdisciplinary opportunities and potential for mutually reinforcing research are the biggest opportunities here.

Interoperability of data which interacts within a system and across systems (e.g. linking land, water, and climate data) is a specific identified benefit. This will allow the information produced to tell a story not just about one environmental domain, but link into the wider system. The SDGs are, themselves, interlinked and broad, so having research that spans the linkages within/across systems and assesses broad questions of human and environmental wellbeing is a valuable function the NSCs can fulfil.

6. What role might the Challenges play in advancing implementation?

Given adequate funding and time, the NSCs could play a meaningful role helping the New Zealand Government to implement the SDG Agenda. This process may be best facilitated by engaging the relevant government agencies with the NSCs to determine the reporting priorities where the NSCs could add value by generating science outputs and associated data to help fulfil New Zealand's SDG implementation.

The Challenges can help with establishing where the greatest potential payoff is available from intervention by improving the evidence base and improving knowledge of the causal mechanisms involved. This can help policymakers identify what is lacking or under threat across the domains encompassed by the SDGs, and make choices based on which interventions will provide best bang per buck (net social benefit).

NSCs could play a role in informing some of the big, long-term policy questions in support of helping NZ achieve the SDGs. The NSCs could use a combination of their local knowledge and international connections to develop information to inform New Zealand's context, the barriers, and opportunities to achieving goals. Furthermore, the NSCs could provide insight into how New Zealand is tracking toward achieving the SDGs, or how changes could be made to more effectively achieve them. The NSCs have strengths in the social and behavioural sciences. This has been identified as a science gap in New Zealand, and will be essential for driving progress towards the goals.

6. References

Biermann, F., Kanie, N., & Kim, R. E. (2017). Global governance by goal-setting: the novel approach of the UN Sustainable Development Goals. *Current Opinion in Environmental Sustainability, 26-27*, 26-31.

Environmental Scientist (2017). Science with out borders: Making the SDGs successful. *Journal of the Institution of Environmental Sciences.* (26)3 Retrieved from https://www.the-ies.org/resources/science-without-borders

Esquivel, V. (2016). Power and Sustainable Development Goals: a feminist analysis *Gender and Development,* 24(1), 9-23.

Hummel, D., Jahn, T., Keil, F., Liehr, S., & Stieß, I. (2017). Social Ecology as critical, transdisciplinary science—conceptualizing, analyzing and shaping societal relations to nature. *Sustainability, 9*, 1050.

International Council for Science [ICSU]. (2017). *A guide to SDG interactions: from science to implementation*. International Council for Science.

Lu, Y., Nakicenovic, N., Visbeck, M., & Stevance, A.-S. (2015). Five priorities for the UN Sustainable Development Goals. *Nature, 520*, 432-433.

Ministry for the Environment [MfE] (2017). Conservation and Environment Science Roadmap. Retrieved from http://www.mfe.govt.nz/publications/about-us/conservation-and-environment-science-roadmap

Ministry of Business, Innovation and Employment [MBIE] (2015a). National Science Challenges Performance Framework Guidance Document (1). Retrieved from http://www.mbie.govt.nz/info-services/science-innovation/national-science-challenges/documents-image-library/key-documents/NSC-performance-framework-guidance-document.pdf

Ministry of Business, Innovation and Employment [MBIE] (2015b). National Statement of Science Investment. Retrieved from http://www.mbie.govt.nz/info-services/science-innovation/national-statement-science-investment

Ministry of Business, Innovation and Employment [MBIE] (2017a). National Science Challenge Terms of Reference. Retrieved from http://www.mbie.govt.nz/info-services/science-

innovation/national-science-challenges/terms-of-reference

Ministry of Business, Innovation and Employment [MBIE] (2017b). Strategic Science Investment Fund. Retrieved from http://www.mbie.govt.nz/info-services/science-innovation/investment-funding/how-we-invest/strategic-science-investment-fund

Ministry of Research Science and Technology. (2007). *Vision Mātauranga*: *Unlocking the Innovation Potential of Māori Knowledge, Resources and People.* Wellington: Ministry of Research, Science and Technology.

Ministry for Primary Industries [MPI] (2017). Primary sector science roadmap. Retrieved from http://www.mpi.govt.nz/news-and-resources/science-and-research/primary-sector-science-roadmap-te-ao-turoa/

OECD (2016). OECD and the Sustainable Development Goals: Delivering on universal goals and targets. Retrieved from http://www.oecd.org/dac/sustainable-development-goals.htm

OECD (2017). Environmental Performance Reviews: New Zealand 2017. Retrieved from http://www.oecd.org/newzealand/oecd-environmental-performance-reviews-new-zealand-2017-9789264268203-en.htm

PCE Parlimentary Commissioner for the Environment (2016). The state of New Zealand's environment: Commentary by the Parliamentary Commissioner for the Environment on 'Environment Aotearoa 2015'. Retrieved from http://www.pce.parliament.nz/publications/the-state-of-new-zealands-environment-commentary-by-the-parliamentary-commissioner-for-the-environment-on-environment-aotearoa-2015

Sachs, J., Schmidt-Traub, G., Kroll, C., Durand-Delacre, & Teksoz, K. (2017). *SDG Index and Dashboards Report 2017*. New York: Bertelsmann Stiftung and Sustainable Development Solutions Network (SDSN).

Saito, O., Managi, S., Kanie, N., Kaufman, J., & Takeuchi, K. (2017). Sustainability science and implementing the sustainable development goals. *Sustainability Science, 12*(6), 907-910.

United Nations. (2015). Transforming Our World: The 2030 Agenda for Sustainable Development. Retrieved from https://sustainabledevelopment.un.org/post2015/transformingourworld/publication

Appendix A

The New Zealand Labour Party and Green Party of Aotearoa Confidence and Supply Agreement

The following section pertains to the Policy Programme section of the Confidence and Supply agreement (2017), which encompasses the bulk of the agreement. Labour has agreed to work with the Green Party on these and other policy areas as may be identified from time to time, and in good faith.

The Green Party supports a transformative Government which implements the 17 Sustainable Development Goals. Within the current parliamentary term, the Green Party has outlined several priorities to advance the implementation of the Sustainable Development Goals. The Labour-led Government will support these priorities. These include the following:

Sustainable Economy

1) Adopt and make progress towards the goal of a Net Zero Emissions Economy by 2050.

2) Reduce congestion and carbon emissions by substantially increasing investment in safe walking and cycling, frequent and affordable passenger transport, rail, and sea freight.

3) Request the Climate Commission to plan the transition to 100% renewable electricity by 2035 (which includes geothermal) in a normal hydrological year.

4) Stimulate up to $1 billion of new investment in low carbon industries by 2020, kick-started by a Government-backed Green Investment Fund of $100 million.

5) Provide assistance to the agricultural sector to reduce biological emissions, improve water quality, and shift to more diverse and sustainable land use including more forestry.

Healthy Environment

6) Safeguard our indigenous biodiversity by reducing the extinction risk for 3,000 threatened plant and wildlife species, significantly increasing conservation funding, increasing predator control and protecting their habitats.

7) Improve water quality and prioritise achieving healthy rivers, lakes and aquifers with stronger regulatory instruments, funding for freshwater enhancement and winding down Government support for irrigation.

8) Safeguard the healthy functioning of marine ecosystems and promote abundant fisheries. Use best endeavours and work alongside Māori to establish the Kermadec/ Rangitāhua Ocean Sanctuary and look to establish a Taranaki blue whale sanctuary.

9) Commit to minimising waste to landfill with significant reductions in all waste classes by 2020.

Fair Society

10) Overhaul the welfare system, ensure access to entitlements, remove excessive sanctions and review *Working For Families* so that everyone has a standard of living and income that enables them to live in dignity and participate in their communities, and lifts children and their families out of poverty.

11) Ensure that every child with special needs and learning difficulties can participate fully in school life.

12) Eliminate the gender pay gap within the core public sector with substantial progress within this Parliamentary term, and work to ensure the wider public sector and private sector is on a similar pathway.

13) Aim to end energy poverty in New Zealand and ensure that every New Zealander has **a** warm, dry, secure home, whether they rent or own.

14) Deliver innovative home ownership models within the State and broader community housing programme.

15) Make tertiary education more affordable for students and reduce the number of students living in financial hardship.

16) Ensure everyone has access to timely and high quality mental health services, including free counselling for those under 25 years.

17) Honour Te Tiriti o Waitangi as the country's founding document.

18) Review, and adequately fund and support, the family re-unification scheme for refugees.

19) Increase funding for alcohol and drug addiction services and ensure drug use is treated as a health issue, and have a referendum on legalising the personal use of cannabis at, or by, the 2020 general election.

20) Strengthen New Zealand's democracy by increasing public participation, openness, and transparency around official information.

Appendix B
Literature review

1 Broad context of the SDGs globally

1.1 What are the SDGs?

The SDGs and targets adopted by the UN General Assembly (Agenda 2030) drive the post-2015 global sustainable development agenda of action. The goals and targets are the outcome of a two-year process of consultation and deliberation with member states and civil society following the UN Conference on Sustainable Development 2012 (Esquivel, 2016; International Council for Science, 2017; Saito et al., 2017; Spaiser et al., 2017). The goals are described as integrated and indivisible, global and universally applicable (Allen, et al. 2016; Collste et al., 2017; Esquivel, 2016; United Nations, 2015). The transformative and integrated nature of Agenda 2030 marks a significant shift for the UN by initiating a single sustainable development agenda for developed and developing countries, and for offering an inclusive and diverse approach to mobilising governments and other actors to achieve the targets (Biermann et al., 2017; Esquivel, 2016; Saito et al., 2017).

1.2 Where did they come from?

The SDGs move beyond the development agenda of the MDGs by linking human development goals and environmental sustainability, and by integrating social, economic and environmental goals and including targets for both developed and developing countries (Bowen et al., 2017; Esquivel, 2016; Hajer et al., 2015). Importantly, the SDGs provide an opportunity to address criticism levelled at the MDGs and the purported limitations of global goal-setting for sustainable development (e.g. implementation and monitoring of progress (Esquivel, 2016), insufficient attention to rights and justice (Joshi, Hughes, & Sisk, 2015), silos (Collste et al., 2017), fragmentation and lack of coherence and integration across goals (Stafford-Smith et al., 2017), and a lack of governance goals (Joshi et al., 2015); see also Biermann et al. (2017)). The SDGs maintain a focus on issues typically associated with developing countries and that were central to the MDGs; namely, poverty, hunger and food security, health, education and access to water and sanitation. In addition to these, issues common to developed and developing countries characteristic of social, economic and environmental systems and concerns are included in the SDGs (Barbier & Burgess, 2017; Esquivel, 2016; Saito et al., 2017; Vasseur et al., 2017). The SDGs are presented in Table 1 below.

The SDGs are a set of non- binding, global goals set by the UN member states that rely on a novel type of governance (Biermann et al., 2017; Yonehara et al., 2017). This means governments are under no legal obligation to transfer the goals into their national legal systems. Rather than a highly regulated and formal institutional structure, the implementation of the SDGs functions through weak institutional arrangements at the intergovernmental level. At the global level, implementation of SDGs is described vaguely and many of the targets are also vague (Biermann et al., 2017). The High-level Political Forum on Sustainable development is a new institution that will act to guide implementation of the SDGs (Boas et al., 2016). Rather than being a weakness, the bottom-up, country-driven aspects of 'governance through goals' are identified as potentially enabling since

countries are able to prioritise goals and work towards those most relevant with their national sustainable development objectives (Biermann et al., 2017).

1.3 Who has signed up to the SDGs?

The SDGs were adopted by all 193 member states of the United Nations. Member states are encouraged to conduct regular reviews of progress. These national reviews will serve as the basis for regular reviews by the High-Level Political Forum (HLFP) (Stafford-Smith et al., 2017). Agenda 2030 stipulates that reviews by the HLPF are "to be voluntary, state-led, undertaken by both developed and developing countries, and involve multiple stakeholders" (United Nations, 2015). The HLPF and regular reviews ensure integration of social, environmental and economic aspects of sustainable development across all sectors and levels and provides a means by which to coordinate and mobilise resources to monitor progress (Stafford-Smith et al., 2017). The voluntary national reviews also provide opportunities for sharing knowledge and experiences among member states and other stakeholders. To date, 65 countries have submitted voluntary national reviews, 22 in 2016 and 43 in 2017 (Table 2).

In addition to the voluntary national reviews, unofficial reporting processes have emerged to assist in identifying obstacles that might affect progress and to assist in prioritising goals. Since 2016, the Sustainable Development Solutions Network has reported on country performance in achieving the SDGs in the annual unofficial SDG Index and Dashboards Report (Sachs et al., 2016; 2017). The *SDG Index and Dashboards* produces a report card on progress based on a 2015 starting point to enable governments and civil society to identify priorities for action, implementation challenges, track progress and ensure accountability.

1.4 Implementation and governance

Implementation of the SDGs relies on member states taking ownership of the goals and establishing a national framework to guide policies, plans and programmes (United Nations, 2015). The national scale is critical to ensuring policy coherence and linkages across sectors and scales, including international alignment and integration (Stafford-Smith et al., 2017). SDGs require an integrated public policy-making approach and shifts in how policy is developed and implemented (Nilsson & Persson, 2017). This includes understanding the linkages and synergies between the various goals and targets, and acknowledging the trade-offs that arise as countries prioritise some goals and targets over others (Barbier & Burgess, 2017; Saito et al., 2017). Coordinating local, national and global responses (Bowen et al., 2017; Fleming et al., 2017; Hajer et al., 2015), and harmonising different policy objectives to avoid contradictory sectoral policies and to mitigate adverse effects from sectoral policies are also important considerations (Nilsson & Persson, 2017).

Understanding the interlinkages and interactions between goals and targets and the implications of these for implementation has led to research focused on assessing models and tools to aid in SDG planning. Nilsson et al., (2016) and the International Council for Science (ICSU), (2017) developed a framework to analyse interactions between SDGs and targets using a seven-point ordinal scale. The framework assigns a score to positive interactions of +1 (enabling), +2 (reinforcing), or +3 (indivisible), while interactions characterised by trade-offs are scored with -1 (constraining), -2

(counteracting) or -3 (cancelling) (ICSU, 2017). The framework was used by the International Council for Science (2017) to explore the interlinkages and interactions between the SDGS, with detailed analyses of SDG2, SDG3, SDG7, and SDG14. The analysis identified potential constraints and conditions that require coordinated policy interventions (International Council for Science, 2017).

Collste et al. (2017) use systems dynamic models designed to explore scenarios for policy integration. They focus on three goals (SDG3, SDG4, SDG7) to model interlinkages and interactions. Allen et al. (2016) assess the strengths and weakness of contemporary modelling tools that can be used to analyse trade-offs and synergies among dimensions of sustainable development to determine their relevance for national SDG planning. Rather than a single model that can analyse all variables pertaining to the goals and targets, Allen et al.,(2016) suggest adopting a nexus approach to analysing priority sectoral issues and combining different models within a broader analytical framework. A nexus approach to the SDGs has the potential to consider the interactions and interconnections among different goals (Boas et al., 2016; Bowen et al., 2017). The application of the nexus approach in the context of the SDGs extends previous research focused on exploring the connections between climate, water, energy and food (Boas et al., 2016).

1.5 What/how science can contribute to the SDGs?

The SDGs are aspirational in their intent and normative in their development and implementation (Esquivel, 2016; Nilsson & Persson, 2017; Saito et al., 2017). The SDGs re-emphasise the importance of integrated research approaches to sustainable development especially in light of the interactions and connections between the goals. Science provides inputs to many of the complex problems the SDGs seek to address, with scientists identified as important actors in policy making, implementation and monitoring, ensuring science-informed analysis of interactions across SDGs and enabling more coherent and effective decision-making based on scientific evidence (Hummel et al., 2017; ICSU, 2017). Lu et al., (2015) urge scientists to support the SDGs and identify five priorities that require intervention by scientists, social scientists and economists to achieve the SDGs: 1) devising metrics; 2) establishing monitoring mechanisms; 3) evaluating progress; enhancing infrastructure to support observations, monitoring and information processing; and 5) standardising and verifying data. They give examples of how science can directly contribute to the attainment of goals. For example, science contributions to achieving SDG6 include scientists selecting water quality standards against which progress can be measured, and monitoring water quality (e.g. pH, turbidity, metal concentrations) to enable comparison against national or regional standards related to human health and ecosystem health. In the case of SDG7, monitoring energy consumption, emissions and health impacts using a range of scientific methods can complement social science research seeking to understand behaviours, values and beliefs and their influence on progress towards achieving SDG7 (Lu et al., 2015).

Science, and scientists, clearly have an important role to play in implementing and monitoring the SDGs (Bowen et al., 2017); however, the tendency to assume that science is neutral belies the contribution of science to creating complex global problems and the biases in scientific research and evidence (De Pryck & Wanneau, 2017; Hummel et al., 2017; Juntti, Russel, & Turnpenny, 2009). In acknowledging the important role of scientists and science in contributing to sustainable development more generally and the SDGs in particular (Bowen et al 2017; Lu et al 2015), questions

arise as to what counts as scientific information, and what constitutes the science perspective (Van der Hel, 2017). The significance of these questions is linked to matters of salience, credibility and authority, where salience relates to the relevance of science institutions and the knowledge they produce; credibility is the perceived scientific adequacy of the information; and legitimacy relates to fairness of knowledge production and assessment, and the extent to which divergent values, interests and beliefs are respected (Van der Hel, 2017).

The way in which science is conducted in the context of sustainability and sustainable development has to also be scrutinised. While there is still clearly a place for disciplinary-based scientific research as part of the strategy to achieve the SDGs, SDG researchers advocate variously for collaborative research (de Hart, 2017), solution-oriented science (Van der Hel & Biermann, 2017), sustainability science (Saito et al., 2017) and evidence-based policy making (Hák, Svatava, & Moldan, 2016; Oldekop et al., 2016; Yonehara et al., 2017). Similarly, the need to integrate natural and social sciences in multidisciplinary, interdisciplinary or transdisciplinary research, and for science to extend beyond academia to include other stakeholders and knowledge holders characterise science approaches targeting the SDGs (McBean & Martinelli, 2017; Van der Hel & Biermann, 2017).

Table 1. Sustainable Development Goals

Goal 1.	End poverty in all its forms everywhere
Goal 2.	End hunger, achieve food security and improved nutrition and promote sustainable agriculture
Goal 3.	Ensure healthy lives and promote well-being for all at all ages
Goal 4.	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
Goal 5.	Achieve gender equality and empower all women and girls
Goal 6.	Ensure availability and sustainable management of water and sanitation for all
Goal 7.	Ensure access to affordable, reliable, sustainable and modern energy for all
Goal 8.	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
Goal 9.	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
Goal 10.	Reduce inequality within and among countries
Goal 11.	Make cities and human settlements inclusive, safe, resilient and sustainable
Goal 12.	Ensure sustainable consumption and production patterns
Goal 13.	Take urgent action to combat climate change and its impacts
Goal 14.	Conserve and sustainably use the oceans, seas and marine resources for sustainable development
Goal 15.	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
Goal 16.	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
Goal 17.	Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development Finance

Table 2. Countries that have completed national voluntary reports to HLPF, 2016-2017

2016	2017
China	Afghanistan
Colombia	Argentina
Egypt	Azerbaijan
Estonia	Bangladesh
Finland	Belarus
France	Belgium
Georgia	Belize
Germany	Benin
Madagascar	Botswana
Mexico	Brazil
Montenegro	Chile
Morocco	Costa Rica
Norway	Cyprus
Philippines	Czech Republic
Republic of Korea	Denmark
Samoa	El Salvador
Sierra Leone	Ethiopia
Switzerland	Guatemala
Togo	Honduras
Turkey	India
Uganda	Indonesia
Venezuela (Bolivarian Republic of)	Italy
	Japan
	Jordan
	Kenya
	Luxembourg
	Malaysia
	Maldives
	Monaco
	Nepal
	Netherlands
	Nigeria
	Panama
	Peru
	Portugal
	Qatar
	Slovenia
	Sweden
	Tajikistan
	Thailand
	Togo
	Uruguay
	Zimbabwe

Note: Adapted from https://sustainabledevelopment.un.org/vnrs/.

2. What are other countries doing with respect to the SDGs?

2.1 Country Profiles

Much of this information comes from the 2017 SDG Index and Dashboards Report (Sachs et al., 2017). This report provides a summary of countries' SDG baselines and compares their performance based on the best country-level data available. Comparing the subset of the countries we highlight in this review, all countries need to improve on multiple goals (see Figure 1). This assessment shows that while countries are meeting some of the goals, there are significant numbers of the goals and their indicators that are not being met. Each of the countries and their performance will be reviewed in the sections below.

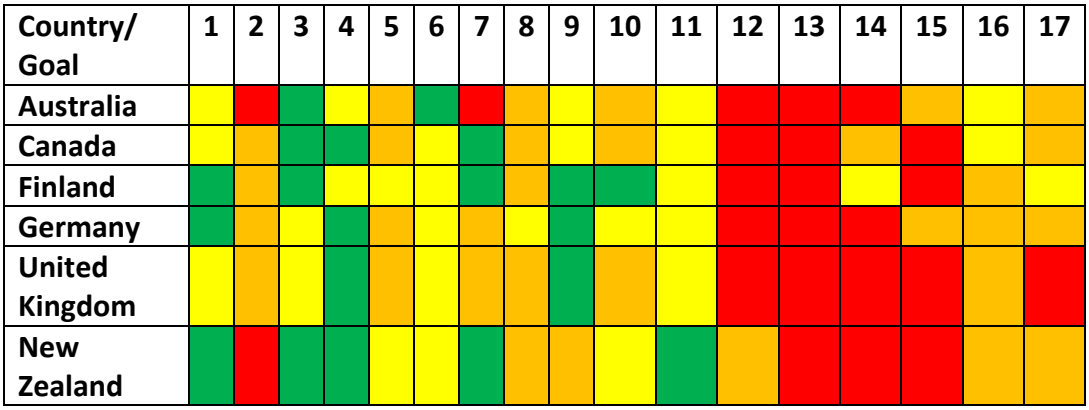


Figure 1. Excerpt from the SDG Index and Dashboards report showing the SDG dashboard for the countries examined in this review. A green rating is given for goal achievement (where all indicators under that goal are met). Yellow, orange and red indicate increasing distance from SDG achievement (from Sachs et al., 2017).

McArthur and Rasmussen (2017) note that the benchmarks set by Sachs et al. (2017) are global thresholds that do not necessarily align precisely with the SDG targets. However, this assessment does provide a consistent, comparative snapshot of SDG attainment globally.

2.1.1 Australia

In Australia, the Department of Foreign Affairs and Trade (DFAT) and the Department of Prime Minister and Cabinet lead the whole of government response to implementing the 2030 Agenda for Sustainable Development (DFAT, n.d.a). The Australian Government is working in partnership with the private sector through their Business Partnerships Platforms, the Global Compact Network Australia and their Australian SDGs Hub for Business, and the Shared Values Project (DFAT, n.d.b). DFAT (n.d.c) is also working with civil society and universities to further advance the SDGs in Australian aid programmes and the Research for Development Impact Network. DFAT provides a significant number of online resources for businesses, civil society and universities to improve their engagement with the SDGs.

Much of Australia's engagement with the SDGs comes through their 2017 Foreign Policy White Paper. The focus of the section on promoting sustainable development is on poverty alleviation,

particularly in the Pacific Region through sustainable economic growth (Australian Government, 2017).

In detail, from Figure 1, Australia still has work to do in the following goals (Sachs et al., 2017):
SDG1 – Poverty rate after taxes and transfers;
SDG2 – Obesity, cereal yield and a suitable nitrogen management index;
SDG4 – Increasing the net primary school enrolment rate;
SDG5 – Improving the proportion of seats held by women in parliament and the gender wage gap;
SDG7 – CO2 emissions from fuel combustion and share of renewable energy;
SDG8 – Adjusted GDP growth and youth not in employment education or training;
SDG9 – Number of patent applications filed;
SDG10 – Gini index and Palma ratio;
SDG11 – Median rent burden;
SDG12 – E-waste generated, production SO2 emissions, nitrogen footprint; non-recycled waste;
SDG13 – All indicators are not being met;
SDG14 – Ocean health index for fisheries; percentage of fish stocks overexploited or collapsed;
SDG15 – Freshwater protected area, Red List species; annual change in forest area, species lost;
SDG16 – Prison population, population safety, government efficiency; weapons exports; and
SDG17 - ODA, health and education spending and financial secrecy score.

Overall, Sachs et al. (2017) rank Australia 26th out of 157 countries globally on performance related to the SDGs.

According to Lennon (n.d.), the President of the Western Australian branch of the United Nations Association, Australia needs to close the gap on food security, agricultural management, nourishment and human health, education, gender, smarter, lower emitting and more efficient energy, economic growth and youth employment, reduce inequality, waste and CO2 emissions, and preserve, protect and extend terrestrial and marine biodiversity. As one path towards SDG attainment, Lennon (n.d.) notes that they are not only for governments, but that everyone from all sectors of society are able to contribute.

2.1.2 Canada

In February 2016, the Canadian Government released a third Federal Sustainable Development Strategy (FSDS) 2016-2019 to guide the government's sustainable development planning and reporting (Environment and Climate Change Canada, 2016). The FSDS focuses on 13 dimensions related primarily to the environmental aspects of the SDGs. The 13 dimensions are effective action on climate change, low carbon government, clean growth, modern and resilient infrastructure, clean energy, healthy coasts and oceans, pristine lakes and rivers, sustainably managed lands and forests, healthy wildlife populations, clean drinking water, sustainable food, connecting Canadians with nature, and safe and healthy communities (Environment and Climate Change Canada, 2016).

In a spring 2017 update, Environment and Climate Change Canada (2017) provided information on the results to date. In General, additional federal funding has been announced for most of the focus

areas, as well as the development and adoption of federal/provincial and North America-wide strategy documents (where indicated in the agreed milestones).

McArthur and Rasmussen (2017) assess the domestic status of Canada's achievement of the SDGs through a more limited number of targets that are able to be assessed through measurable and quantifiable targets or the establishment of a proxy target. Thus, 78 targets across the SDGs are assessed. A summary of this assessment can be seen in Figure 2.

Sustainable Development Goal	Moving backwards	Breakthrough needed	Acceleration needed	On track
1 Poverty		•	•	• • •
2 Hunger & food systems	• • •			
3 Good health & well-being	•	• •	• • • • • •	• • •
4 Quality Education	• •	•		• • •
5 Gender equality	•	• • • • •		
6 Clean water & sanitation	• •	• •	•	
7 Affordable & clean energy	•	•	•	•
8 Decent work & economic growth		• •	•	•
9 Industry, innovation & infrastructure	•	• •		
10 Reduced inequalities	•	•		
11 Sustainable cities & communities	• • •			•
12 Responsible consumption & production		• • •		
13 Climate action		•		
14 Life below water	•		•	• •
15 Life on land		• • •		•
16 Peace, justice & strong institutions	• •	• •	•	• •
	18	26	12	17

Figure 2. Summary of Canada's domestic status on 73 SDG indicators (from McArthur & Rasmussen, 2017).

A general summary of McArthur and Rasmussen's (2017) report include Canada needing a breakthrough to cut domestic poverty by 50%; indigenous people are more likely to face severe inequality, poverty, food insecurity, access to medical care and violence; there are differences in attainment of the SDGs between provinces, and in particular territories where the majority of the population is indigenous; a low percentage of Canadians have confidence in government institutions; failure to be on track with gender equality measures; climate change and protection of terrestrial and marine areas needs significant work, and measures to ensure that a significant proportion of the population has basic literacy and numeracy skills.

In detail, from Figure 1, Canada still has work to do in the following goals (Sachs et al., 2017):
SDG1 – Poverty rate after taxes and transfers;
SDG2 – Obesity and a suitable nitrogen management index;
SDG5 – Improving the proportion of seats held by women in parliament and the gender wage gap;
SDG8 – Adjusted GDP growth and youth not in employment education or training;
SDG9 – Mobile broadband subscriptions and number of patent applications filed;
SDG10 – Gini index and Palma ratio;

SDG11 – Median rent burden;
SDG12 – E-waste generated, production SO2 emissions, nitrogen footprint; non-recycled waste;
SDG13 – CO2 emissions per capita; imported CO2 emissions; effective carbon rate from transport;
SDG14 – Marine protected area, ocean health index for fisheries; percentage of fish stocks overexploited or collapsed;
SDG15 – Freshwater and terrestrial protected area, annual change in forest area, species lost;
SDG16 – Prison population, weapons exports; and
SDG17 - ODA, health and education spending and financial secrecy score.

Overall, Sachs et al. (2017) rank Canada 17th out of 157 countries globally on performance related to the SDGs. However, the conclusion from McArthur and Rasmussen is that Canada will need to do significant work to achieve a breakthrough and achieve the SDGs domestically.

2.1.3 Finland

The Finnish Foreign Ministry highlights that Finland strives to support the implementation of the SDGs nationally and globally. Globally, this is to be accomplished through Finnish development policy (Ministry of Foreign Affairs for Finland [Formin], n.d.). Nationally, Finland has developed the 'Society's Commitment to Sustainability' tool which brings together stakeholders from a wide variety of fields to promote the SDGs. The government is focusing on carbon neutrality, wise use of resources, non-discrimination and equality (Formin, n.d.). Domestically, the Prime Minister's Office (n.d.) oversees the work of the National Commission on Sustainable Development to ensure that the SDGs are included in domestic policy.

In late 2016, the Prime Minister's Office (2016) published a report on the implementation of the Agenda for Sustainable Development. The report highlights institutional mechanisms in place – coordinating bodies and networks and an indicator network, and mechanisms for encouraging participation, for example. Figure 3 shows the linkages between Finland's national goals and the SDGs.

With respect to achievements, Paul (2017) notes there have been over 400 commitments made by the government of Finland around the SDGs and the 2030 Agenda for Sustainable Development. While Finland appears to be implementing the SDGs, there are no available assessments in English examining the efficacy of this implementation.

Figure 3. Links between Finnish Government goals and the SDGs (Prime Minister's Office, 2016).

In detail, from Figure 1, Finland still has work to do in the following goals (Sachs et al., 2017):
SDG2 – Obesity and a suitable nitrogen management index;
SDG4 – Expected years of schooling;
SDG5 – Gender wage gap;
SDG6 – Imported groundwater depletion;
SDG8 – Adjusted GDP growth and youth not in employment education or training;
SDG11 – Median rent burden;
SDG12 – E-waste generated, production SO2 emissions, imported SO2 emissions nitrogen footprint, net imported emissions of nitrogen, non-recycled waste;
SDG13 – CO2 emissions per capita; imported CO2 emissions; effective carbon rate from transport;
SDG14 – Ocean health index for clean water;

SDG15 – Annual change in forest area, species lost;
SDG16 – Homicides, weapons exports; and SDG17 - ODA.

Overall, Sachs et al. (2017) rank Finland 3rd out of 157 countries globally on performance related to the SDGs.

2.1.4 Germany

On 1 November 2016, The German Parliament ratified a revised and renewed 'German Strategy for Sustainability' (Die Bundesregierung, 2016). Germany's strategy is driven by a vision of a sustainable future for generations to come, and the SDGs are an integral part of this. Germany recognises that seeking to achieve the SDGs provides a strong opportunity for its economy to benefit from innovation and the development of key technologies.
Germany's strategy was developed through five public conferences which included government representatives, NGOs, and the public. These conferences were accompanied by an internet campaign where the draft document could be commented on. The German Sustainability Strategy recognises that it can only be successful if three principles can simultaneously be achieved: that of being economically efficient, socially balanced, and ecologically sustainable. Concrete measures to achieve the 17 SDGs exist on three different levels: Measures within Germany; measures by Germany with a global impact; and, measures together with Germany bilaterally with other countries. The German Sustainability Strategy contains 63 key indicators which are based on quantifiable numbers and statistics. For each of the 17 SDGs at least one key indicator is defined. It is recognised that regular monitoring is essential to assess the need for adjustment. The German Statistics Office will publish progress on each of the 63 indicators every two years. At present, 27 indicators are on track, 29 are viewed critically, and for 9 a conclusion cannot be reached at present. The strategy itself will be revised every four years. The principal of sustainability is to be an integral part of any proposed legislation right from the beginning of the legislative process. All federal ministries have this principle at the core of their processes and are they are encouraged to lead by example. The government has ratified a catalogue of measures for government ministries & departments that aim to reduce the carbon footprint of all administrative buildings, procurement, and the work/life balance of public servants. It is recognised that the topic of sustainability touches all areas of policymaking. Therefore, responsibility for implementing the strategy has been placed with the Office of the German Chancellor (equivalent to New Zealand's Department of Prime Minister and Cabinet). To ensure coherent measures and principals, each ministry will establish a resource coordinator position as a contact person. The Council for Sustainability consists of 15 independent members representing the three dimensions (economy, society, ecology). It was established in 2001 and advises the government on sustainability issues. It also has the task of taking its views to the public, and guides the further development of the German Sustainability Strategy.

In May 2017, the German Sustainability Strategy launched a science platform to support the implementation of the SDGs. The mission of the science platform is to reflect on sustainability policy and provide new impetus for innovation in policymaking and society, as well as for science and research. The platform will address topics of current political and social debate, with the appropriate urgency and scientific depth. Examples include mobility and the future of employment. The platform will address cross-sectoral issues that are reflective of the integrative character of the SDG Agenda, and which would therefore benefit from interdisciplinary scientific analysis. One such issue is the

role of natural resources and public goods in achieving the targets of multiple Sustainable Development Goals (SDGs). It is recognised that the platform's success will be dependent on its ability to stimulate dialogue between scientists and stakeholders from the areas of policymaking, business and civil society.

2.1.5 United Kingdom

The UK Government's 'Agenda 2030: Delivering the Global Goals report' (2017) states that they are firmly committed to delivering the SDGs both at home and around the world. The UK were at the forefront of negotiating the SDGs and assert that they will continue to remain at the forefront of delivering them. The underlying aim of the SDGs are reflected in the UK Government's programme of work and are embedded in their Single Departmental Plans (SDP). The UK acknowledges that the purpose of the SDGs is to eradicate extreme poverty; therefore, their Department of International Development (DFID) retain the policy oversight for the SDGs. The UK Government and the Office of National Statistics (ONS) will report progress against the Goals in line with the UN follow-up review process. ONS will provide available UK data against the global indicators to the UN for their annual progress reporting. The UK's 'Agenda 2030: Delivering the Global Goals report' (2017) provides a comprehensive outline of their current progress towards the Goals. The UK has already contributed towards all 17 Goals both "at home" and "around the world". These efforts are in collaboration with the private sector and NGOs.

In November 2017, the UK published their first report on progress made towards measuring the Sustainable Development Goal indicators 'Sustainable Development Goals: progress and possibilities: November 2017'.

In detail from Figure 1, the UK still has work to do in the following goals (Sachs et al., 2017):
SDG1 – Poverty rate after taxes and transfers;
SDG2 – Obesity and a suitable nitrogen management index;
SDG3 – Age-standardised death rate attributable to household air pollution and ambient air pollution;
SDG5 – Proportion of seats held by women in national parliament and gender wage gap;
SDG6 – Imported groundwater depletion;
SDG7 – CO2 emissions from fuel combustion and share of renewable energy in total final energy consumption;
SDG8 – Adjusted GDP growth and youth not in employment education or training;
SDG10 – Gini index and Palma ratio;
SDG11 – Concentration of particulate matter and median rent burden;
SDG12 – E-waste generated, imported SO2 emissions, nitrogen footprint, non-recycled waste;
SDG13 – CO2 emissions per capita; imported CO2 emissions; effective carbon rate from transport;
SDG14 – Ocean Health Index for clean water, Ocean Health Index fisheries, and percentage of Fish Stocks overexploited or collapsed;
SDG15 –Red List Index of species survival, annual change in forest area, species lost;
SDG16 – Prison population, proportion of people who feel safe walking alone at night, weapons exports;
SDG17 – Government health and education spending, tax haven score, and financial secrecy score.

Overall, Sachs et al. (2017) rank the UK 16th out of 157 countries globally on performance related to the SDGs.

3. State of Play in New Zealand

3.1 Introduction

In contrast with the previous global development paradigm, The Millennium Development Goals (MDGs), the SDGs were designed to apply to all countries irrespective of development status. Despite New Zealand's adoption of the SDGs in September 2015, there is limited information regarding their progress towards the SDGs.

As a member of the United Nations, New Zealand is expected to report regularly on how it is achieving the SDGs. As mentioned previously, country-led national SDG reporting is to be state-led. In regards to reviewing efforts made towards the SDGs, New Zealand's Ministry for Foreign Affairs and Trade (2016b) explains:

> *New Zealand has emphasised the importance of measuring and tracking effectively their implementation without adding additional layers of bureaucracy. Officials are currently working across different agencies to coordinate indicators and results measurement and reporting systems.*

NZ's progress towards the SDGs is not clear. New Zealand is not one of the 65 UN member countries to complete a National Voluntary Report (Table 2), however it is scheduled to do so in 2019. However, as mentioned above, the recent change in government has resulted in a shift towards explicitly contributing towards the SDGs with the 2017 Labour-Green Confidence and Supply Agreement laying out the government's priorities, plans and commitments (see Appendix A). Prior to the change in government, information on New Zealand's commitment to the SDGs largely consisted of non-governmental efforts. Although documentation on NZ's explicit contribution towards the SDGs is limited this does not mean that NZ's development goals do not align with the SDGs. This is illustrated in a speech delivered by the former Minister for Climate Change Issues, Paula Bennett (MFAT, 2016c):

> *There is a lot of alignment between the objectives contained in the SDGs and what the New Zealand Government is already working to achieve. Growing the economy, improving living standards, health, and education, creating jobs, increasing the supply of affordable housing, encouraging women in leadership, keeping our communities safe, and protecting our environment: these are some of the issues that are of greatest importance to New Zealanders, and where the New Zealand Government is focussing our hard work.*

The Sustainable Development Goals (SDGs) are one component of the United Nations 2030 Agenda for Sustainable Development. Thus, some of the initiatives undertaken are not necessarily framed in terms of the SDGs, but as contributing to the Agenda for Sustainable Development.

3.2 Which NZ government departments are involved and what are they doing?

A transformative trajectory towards committing to the Sustainable Development Goals is already in motion due to the current political climate associated with the change in Government.

The current 'State of Play' follows a trajectory laid out during the Fifth Labour-led Government (1999-2008). Before 2016, and in the absence of a global framework under which the New Zealand government could align its sustainability goals, sustainability in NZ was largely influenced by the World Summit on Sustainable Development (WSSD) and the Sustainable Development for New Zealand Programme of Action (Department of Prime Minister and Cabinet, 2003). The Labour-led Sustainable Development for New Zealand Programme of Action acknowledged the key role of Government in articulating sustainability outcomes and directions. Until 2015, government departments formulated and implemented their own sustainability goals.

In September 2015, New Zealand ratified the Sustainable Development Goals. Prior to ratification, sustainability efforts of government departments were largely distributed between economic, environmental and social categories. These spheres of sustainability are still evident in Statistics New Zealand's (Stats NZ) 'NZ Progress Indicators' (Stats NZ, n.d.). Specific departments have led on particular spheres of sustainability. For example, The Ministry of Social Development has worked with other government departments, as the social sector representative for the Programme of Action. However, since the Sustainable Development Goals are indivisible, efforts need to be more integrated and collaborative.

Since ratification, collaborative efforts have been made across and between sectors to work towards achieving goals. Linkages can also be made between the goals and recently published government reports and initiatives. For example the 'Our Atmosphere and Climate 2017' report published in October 2017 by Ministry for the Environment (MFE) and Stats NZ may not specifically mention the SDGs but provides supportive information and initiatives nonetheless. Also, the Ministry for Primary Industries (MPI) Sustainable Land Management and Climate Change (SLMACC) Research Programme and Sustainable Farming Fund (SFF) show linkages to the SDGs.

Government departments that have explicitly made or intend to make efforts towards the SDGs include the following:

3.2.1 New Zealand Ministry of Foreign Affairs and Trade (MFAT)

New Zealand's National Statement, delivered by Hamish Cooper (MFAT, 2016) at the High Level Political Forum on Sustainable Development (HLPF), regards the SDGs as an important frame of reference for policy development.

MFAT (2016) notes that New Zealand's efforts to achieve the SDGs encompass a combination of domestic action, international leadership on global issues, supporting other countries through the New Zealand Aid programme and other international cooperation instruments[1].

At the 2017 New Zealand Parliamentarians' Group on Population and Development Sustainable Development Goals Forum, Charlotte Darlow, Divisional Manager of the Pacific Regional Division from MFAT highlighted important linkages between the New Zealand Aid Programme's strategic plan and the SDGs. Particularly the importance of SDG 5. Darlow explained: *"The gender equality goal is incredibly important and has the potential to be the most transformational of the goals. At MFAT we're looking at how we consider gender right at the beginning of development initiatives to give us better results down the track".* (Family Planning New Zealand, 2017).

Furthermore, MFAT acknowledges that NGOs and businesses in New Zealand are already considering how their work contributes to achievement of the SDGs, and are engaging productively with government agencies. Through a joined-up approach, New Zealand will continue to prioritise efforts to meet the high level of ambition set out in Agenda 2030.[2]

3.2.2 Ministry for Primary Industries (MPI)

In September, 2017 DairyNZ, the Dairy Companies Association of New Zealand (DCANZ) and the Ministry for Primary Industries (MPI) endorsed the Dairy of Declaration of Rotterdam, which marks New Zealand's Commitment towards global sustainable dairy development. This endorsement is considered a signal of strong support for the UN 2030 Agenda for Sustainable Development. MPI Director-General Martyn Dunne stated that *"New Zealand is engaged in collective global efforts to promote the efficient use of natural resources and combat climate change, such as the Global Research Alliance on Agricultural Greenhouse Gases, and the Global Dairy Agenda for Action."* (Dairy NZ, 2017).

3.2.3 The Treasury

Treasury has produced the following information regarding the SDGs based on an Official Information Act:

Thank you for your Official Information Act request, received on 26 September 2016. You requested:

1. *Is the Treasury a part of any work or project relating to Sustainable Development Goals*
2. *If so, what does this project or work entail?*
3. *Are there any other departments that are also part of this?*
4. *What are the key milestones, actions in past and in the next 12 months?*
5. *Has the Treasury been a co-author in any documents relating to this? Please provide any copies from the last six months*
6. *What is the level of resourcing (FTE) as part of this work?"*

[1] These actions are explained further on https://www.mfat.govt.nz/en/peace-rights-and-security/work-with-the-un-and-other-partners/new-zealand-and-the-sustainable-development-goals-sdgs/

[2] MFAT state that reporting on the SDGs is voluntary. No further explanation on individual goals and targets.

The Treasury continues to be involved in wider work supporting the Government's efforts to reduce disadvantage, in particular for at risk children. We have also been involved in preliminary discussions with other Government agencies on the Sustainable Development Goals. However we are not involved in any work directly focussed on Sustainable Development Goal 1. Further information about the Sustainable Development Goals and what they mean for New Zealand is available here: https://www.mfat.govt.nz/en/peace-rights-andsecurity/work-with-the-un-and-other-partners/new-zealand-and-the-sustainabledevelopment-goals-sdgs/. Consequently, I have decided to decline your request under section 18(e) of the Official Information Act – the document alleged to contain the information requested does not exist or, despite reasonable efforts to locate it, cannot be found. Please note that this letter (with your personal details removed) and enclosed documents may be published on the Treasury website. This fully covers the information you requested. You have the right to ask the Ombudsman to investigate and review my decision. Yours sincerely Chris Nees Team Leader, International"

However, on 13 Dec 2017 The Treasury updated their Higher Living Standards page and outlined 'A Four Capitals approach' which is linked to the Treasury Living Standards Framework (LSF) which is currently being developed, however does not explicitly cite the SDGs.

3.3 Which NZ business 'peak bodies' are involved and what are they doing?

In contrast with governmental efforts, many New Zealand businesses have explicitly committed to the goals. The Sustainable Development Council (SBC) is the leading sustainability 'peak body' in New Zealand's business community and is the only Global Network Partner of the World Business Council for Sustainable development in New Zealand. The SBC is a member organisation that aspires to mainstream sustainable business practices within the New Zealand business community by providing sustainability solutions and tools for businesses to become more sustainable and connecting members to work together on sustainable projects. SBC members are required to reduce greenhouse gas emissions and annually report on progress made towards addressing environmental, social and economic issues.

3.3.1 The Sustainable Business Network

The Sustainable Business Network (SBN) is a member-based social enterprise that helps businesses to succeed through sustainability. Their vision is to make NZ a model sustainable nation. To realise this vision SBN helps members succeed in four areas considered critical for New Zealand: Renewables- enabling the use of renewable energy**;** Community- building thriving communities**;** Mega efficiency- maximising the use of all resources**;** Restorative - enhancing NZ's natural capital.

The NZI Sustainable Business Network Awards which have been running for 15 years, are the leading and longest-standing sustainability awards in New Zealand. Winners of the 2017 SBN awards include: Vector LTD, winner of the 'Revolutionising Energy' category and

New Zealand Post, winner of the 'NZI Greatest Contribution to a Sustainable New Zealand (Supreme Award)'.However, NZ Post do not explicitly state that they are working towards achieving the SDGs.

Businesses of note contributing to sustainability include the following:

3.3.2 Z-Energy

Z-Energy Ltd is considered one of NZ's leaders in sustainable business practices. The SDGs are explicitly integrated into their business models with an outline of their commitments made available online. Z- Energy explicitly mention which goals they have incorporated into their corporate governance model and what they seek to achieve. They have aligned their business to goals 6, 7, 11, 12, 13.

Z-Energy state that they are capable of demonstrating their efforts towards achieving the following SDGs by 2020:
SDG6 – Use water as efficiently as possible
SDG7 – Use electricity efficiently and reduce consumption comparative to their 2012 baseline by 30%
SDG12 – Reduce waste to landfill year on year from their operations (offices, terminals and Z retail sites) continue to move towards being zero waste;
SDG13 – Reduce carbon emissions by 30 % and offset those they are unable to avoid;

Z-Energy also state that through leadership, advocacy and partnership they can inspire and enable New Zealanders to innovate and lead the world in taking responsibility and action to reduce their environmental impact and achieve the goals. Their ambitions are as follows:

SDG11 – Through our activities our customers have experienced emerging transport technologies.
SDG13 – We developed and implemented solutions that enabled our customers to simply and effectively offset their emissions from the use of our fuels; we built a range of partnerships and business opportunities that are helping New Zealand move to a low emission economy; we partnered with local permanent forest providers to maximise the community benefit of our offsetting and carbon procurement activities; we lead and generate the development of policy that moves New Zealand to a low emission economy.

Accomplishments to date include:

- Rainforest alliance certification
- Switched to LED lighting Z Bio D biodiesel (New Zealand's first biodiesel production plant).

3.3.3 Vector Ltd

Vector LTD has also committed to supporting the SDGs. Their commitments are outlined in their Sustainability Policy and Annual Report for 2017.

Vector's Sustainability Policy states that they have identified six goals they are currently focussing on along with goal 17 partnerships. These are goals 3, 7, 9, 10 and 13.

The following list outlines the current ways in which Vector is contributing to the SDGs:

- Leadership - part of the CE group on climate change and natural resources; living wage accredited; no qualifications; rainbow tick; Net Zero report (sponsor and opinion piece); physical effects of climate change on Auckland Network; Vector view of the economic impacts of a transition to a low carbon economy
- Showcasing new technologies – Vector Lights (lighting up the harbour bridge with LED lights)
- Setting ambitious targets – Net Zero by 2030
- Thought leadership tours– Will Steffen, Rory Christian, Seth Goldman and Simon Corbell (coming in Feb 2018); sponsor of Climathon 2017
- Contributing to policy development – Productivity Commission submission; member of Business NZ Energy Council; engaging with Commerce Commission on sustainability
- Projects – Vector Lights, Dominion Salt, mPrest, Kupe Street, Pacific Islands projects through Powersmart
- Partnerships – Ngati Whatua Kupe St; Auckland Council community energy efficiency project
- Communicating – sustainability and the SDGs embedded in Annual Report; CRO presentation to SBC membership on how they have approached the goals; opinion pieces on transition to carbon economy
- Educating – schools programme that is about to be revamped with increased sustainability focus

3.3.4 Air New Zealand

Air New Zealand is considered a leader in corporate governance and sustainable development. Air New Zealand's Sustainability Report for 2017 outlines their ambitious 2030 Goals which are divided into three categories: 'Our People *Manaakitanga';* 'Our Place *Kaitiakitanga';* and, 'Our Economy *Ōhanga Ora'*

'Our People *Manaakitanga":*

- Air New Zealanders (aligns with goals 3, 5, 8, 10 and 15) Air New Zealand is a global benchmark organisation for its employee engagement, grounded in its distinct employee experience that ensures safety and fosters high performance, innovation, community involvement, diversity and inclusion.
- Communities (aligns with goals aligns with goals 3, 8, 10 and 13) Air New Zealand is recognised as the most influential exponent of strategic community investment in New Zealand, helping build cohesive, resilient and sustainable communities across the country.

'Our Place *Kaitiakitanga'*

- Carbon (aligns with goals 7, 12 and 13): Air New Zealand has stabilised emissions through carbon neutral growth post 2020, in a way that simultaneously drives significant environmental, social and economic benefits.

- Nature and Science (aligns with goals 13, 14 and 15): Air New Zealand has enabled world leading conservation and climate science, engaging in long term strategic partnerships to help protect New Zealand's precious natural capital.

'Our Economy *Ōhanga Ora'*

- Tourism (aligns with goals 12 and 8): Air New Zealand has played a pivotal role in the New Zealand tourism sector delivering economic prosperity while enhancing natural and cultural resources, and providing outstanding experienced for visitors and New Zealanders alike.
- Trade and Enterprise (aligns with goals 12 and 8): Air New Zealand has enabled the distribution and promotion of sustainable products and services around the globe, and has developed a world-class supply chain to support sustainable New Zealand businesses of all sizes.

Air New Zealand's recent contribution towards the SDGs include the following:

- A 2017 top 3 corporate social responsibility organisation in New Zealand for embedding sustainability management capabilities.
- Light vehicle fleet transitioned to electric options
- Supreme Award winner SBN's NZI greatest contribution to a sustainable New Zealand Award.
- 39 % female on senior leadership team and Diversity Awards New Zealand 2017 Empowerment Award Winner for innovative responses to empowering women in workplace
- Supreme Award Winner at Māori Language Awards 2016 for efforts to increase usage of Te Reo
- Antartica 3 year climate science program commenced

The Sustainable Development Goals (SDGs) are one component of the United Nations 2030 Agenda for Sustainable Development. Thus, some of the initiatives undertaken by entities are not necessarily framed in terms of the SDGs, but as contributing to the Agenda for Sustainable Development. Where feasible, these initiatives and activities are (subjectively[3]) mapped to the SDGs.

3.4 What is the NZ research and education sector doing towards the SDGs?

The New Zealand Research 'sector' has been defined to include publicly funded Crown Research Institutes (CRIs) and private research institutions. Universities are described separately, as some have additional areas (e.g. teaching and student pastoral care) in which they are able to give effect to the Sustainable Development Goals (SDGs). The majority of the information that makes up this

[3] By subjectively, we have not used any framework to map the initiatives or activities to the SDGs, but have mapped them based on our best professional understanding of the initiative and SDGs.

section was obtained from institutional websites, thus there are limited references, but a list of websites consulted to complete this section is appended.

3.4.1 Crown Research Institutes (CRIs)

The seven CRIs in New Zealand (AgResearch, Environmental Science and Research Ltd (ESR), Institute of Geological and Nuclear Science (GNS), Manaaki Whenua-Landcare Research (MWLR), NIWA, Plant and Food Research, Scion) and Callaghan Innovation have varying degrees of engagement with the SDGs. Four CRIs and Callaghan Innovation do not explicitly mention the SDGs (AgResearch, ESR, GNS and Plant and Food Research), however some of their work can be mapped (subjectively at this stage) to show some contribution to the SDGs.

In a search of the ESR website, their current research into bioreactors to denitrify water from dairy farms appears to be related to the SDGs, in particular, goal 6. The first phase of a trial was completed in 2016, with a second phase set to begin in 2017. No other details were provided.

Manaaki Whenua-Landcare Research (MWLR) and its subsidiaries are involved in research, operational and commercial work towards the SDGs. The MWLR website notes that they identify the SDGs that their research and business activities support, however, this section of the website is not complete. The MWLR Annual Report highlights their business activities, including CarboNZero certification, building and technology upgrades contribute to a number of SDGs, including 8, 9, 12 and 13 (MWLR, 2017). These business activities are scheduled to run through until 2022 (MWLR, 2017). MWLR subsidiary Enviro-Mark Solutions is working with industry partners to develop several yet to be announced SDG related business solutions (REF).

NIWA specifically notes that they are developing a national climate change adaptation plan for New Zealand under the auspices of SDG 13 and the UNFCCC, specifically related to SDG target 13.1. As of the end of 2017, a scoping report has been completed. Other research that NIWA undertakes around climate change and the oceans would contribute broadly to SDGs 13 and 14.

Plant and Food Research, while not specifically mentioning the SDGs, conducts research into sustainable production systems, which includes crops and fisheries, development of new technologies to reduce environmental impact and improving crop production in developing countries (Plant & Food Research, 2017). These research activities can be broadly mapped to SDGs 2, 8, 9, 12, 13 and 14.

Scion, the New Zealand Forest Research Institute is the New Zealand representative for the Sustainable Wood for a Sustainable World (SW4SW) programme of the Food and Agriculture Organisation of the United Nations. The SW4SW programme is about demonstrating how sustainable forestry can contribute substantively to the SDGs (Figure 4), and supporting governments and industry to move in that direction. Scion is actively supporting forestry, wood products, wood-derived materials and other biomaterials sectors to achieve the SDGs through research, science and technology development.

Figure 4. Infographic depicting where sustainable forestry and forest products can contribute to all of the SDGs.

Callaghan Innovation is a government entity that has been set up to assist New Zealand hi-tech businesses to succeed, through providing access to experts, R&D grants, technology and product development, and building skills and capacities. There was no explicit mention of the SDGs, however, the work that Callaghan Innovation does can be mapped to SDG8 and 9.

The Cawthron Institute is New Zealand's largest private research/ science organisation, focusing on many aspects of marine and freshwater environments. Four key areas of research focus include coastal and freshwater, biosecurity, food safety and analysis and aquaculture (Cawthron Institute, n.d.). While there is again, no explicit mention of the SDGs, these four research focus areas can be mapped to SDGs 2, 8, 12, 14 and 15.

In 2017, the New Zealand Government announced three new Regional Research Institutes (RRIs) that would be established – the Centre for Space Science Technology, the New Zealand Institute for Minerals to Materials Research and the New Zealand Research Institute for Viticulture and Oenology. As these RRIs are still being established, we are unable to determine how their future work may contribute to the SDGs. Once these RRIs are more established, they may be able to be assessed as to how they may contribute to the SDGs.

In addition to the more formal research institutes noted above, under the Commodities Levy Act, primary producers in New Zealand pay a levy on the products that they produce. This levy is used, in part to provide strategic direction to their industry, as well as fund research. The levy is collected and disbursed by a sort of industry peak body, for example, DairyNZ, the Forest Growers Levy Trust, Beef & Lamb New Zealand. These peak bodies may undertake their own 'in house' research, or may contract it out to other providers. Of the industry bodies, DairyNZ highlights their contribution to the SDGs through the endorsement of the Dairy Declaration of Rotterdam, which includes goals of feeding the world with safe and sustainable dairy products. In a New Zealand context, DairyNZ claims the sector will support achievement of the SDGs through economic, social, environmental and health perspectives.

3.4.2 New Zealand Universities

New Zealand has eight full universities, all engaged in teaching and research, much of which could contribute to the SDGs. This section provides an overview of what each university is doing with respect to the SDGs from their own websites. Individual researchers and university teachers may be contributing initiatives and activities towards the SDGs that have not been picked up in this scan. These individual initiatives and activities are beyond the scope of this survey.

The University of Auckland

The University of Auckland was the first university in New Zealand to join the United Nations Sustainable Development Solutions Network, which was set up to mobilise scientific and technological expertise for promoting practical solutions for sustainable development. As a part of this initiative, in 2017 the university held a forum for staff on how they can foster and support actions for sustainability at the university. The university also hosts a development fund for faculty that supports the goal of quality education (SDG4).

Outside of these university-wide initiatives, individual faculties have undertaken their own activities and initiatives. The Faculty of Education and Social Work has partnered with community organisations to achieve zero hunger (SDG2). The Faculty of Medical and Health Sciences has held a SDG awareness week in conjunction with Universitas 21 which highlighted research and 'on-the-ground' activities that help achieve some of the SDGs. During the SDG awareness week, research into Child friendly cities, and poverty and hunger was highlighted, while on-the-ground work building medical capacity in developing countries was also showcased. The awareness week goals showcased included 1, 2, 3 & 11.

The Auckland University of Technology

The Auckland University of Technology was the second New Zealand university to join the UN Sustainable Development Solutions Network. In the past year, the university has participated in the University Scholars Leadership Symposium, dedicated to the SDGs, while the university Office of Pacific Advancement has organised a number of activities around climate action in the Pacific (SDG13) and the sustainable use of oceans and seas (SDG14). Throughout 2018, the AUT South Campus has organised a series of activities each month to highlight one or more of the SDGs. For

example, in February 2018, there is a women's health conference, pride festival and environmental education collaboration events being held, which relate to goals 3, 5 and 11. These types of events will be hosted throughout the year.

The University of Waikato

The University of Waikato has incorporated aspects of SDGs into their Master of Māori and Pacific Development, as well as being the host for the Waikato Tourism Observatory, part of a UN supported network involved in sustainable tourism. In addition, individual researchers have been investigating aspects of the SDGs in their own work.

Massey University

A search of the Massey University website provided no information on activities or initiatives being undertaken by the university. Individual faculty members appear to be pursuing their own research around the SDGs, and some have used their positions to critique the New Zealand Government on SDG achievements nationally.

Victoria University of Wellington

Victoria University of Wellington has become the first New Zealand university to sign up to a new international initiative, the 'University Commitment to the Sustainable Development Goals' (UCSDG). The UCSDG is a statement that outlines the university's commitment to support and promote the SDGs in research, teaching and operations. It is a component of the UN Sustainable Development Solutions Network. Researchers and teachers at Victoria University are undertaking research into sustainable development challenges and provide student opportunities around sustainable development. The former Assistant Vice-Chancellor of Sustainability, Marjan van den Belt, is a co-author of the publication "Getting started with the SDGs in universities: A guide for universities, higher education institutions and the academic sector". She is also the organiser of an upcoming symposium on the SDGs in Wellington in April 2018. The university has also incorporated the SDGs in their Development Studies curriculum.

The University of Canterbury

The University of Canterbury in Christchurch highlights a number of individual researchers and associated seminars around the SDGs. Lincoln University, also in the Canterbury region still refers to the Millennium Development Goals as being part of their International Rural Development Programme. There was no reference to the SDGs.

The University of Otago

The University of Otago Business School has adopted the SDGs as part of its strategic mission, the Sustainability Office has initiated "Operation Global Goals" to help students work towards achieving the SDGs in their studies. The University of Otago also hosts the New Zealand Centre for Sustainable Cities (NZCSC). NZCSC faculty have co-authored the ICSU "Guide to SDG Interactions: From Science

to Implementation", and are hosting the 8th International Conference on Energy and Environment of Residential Buildings. The University of Otago attempts to contribute to achieving all of the SDGs. There are also several polytechnic institutions of higher education that have been deemed outside of the scope of this review.

3.5 New Zealand Civil Society Organisations

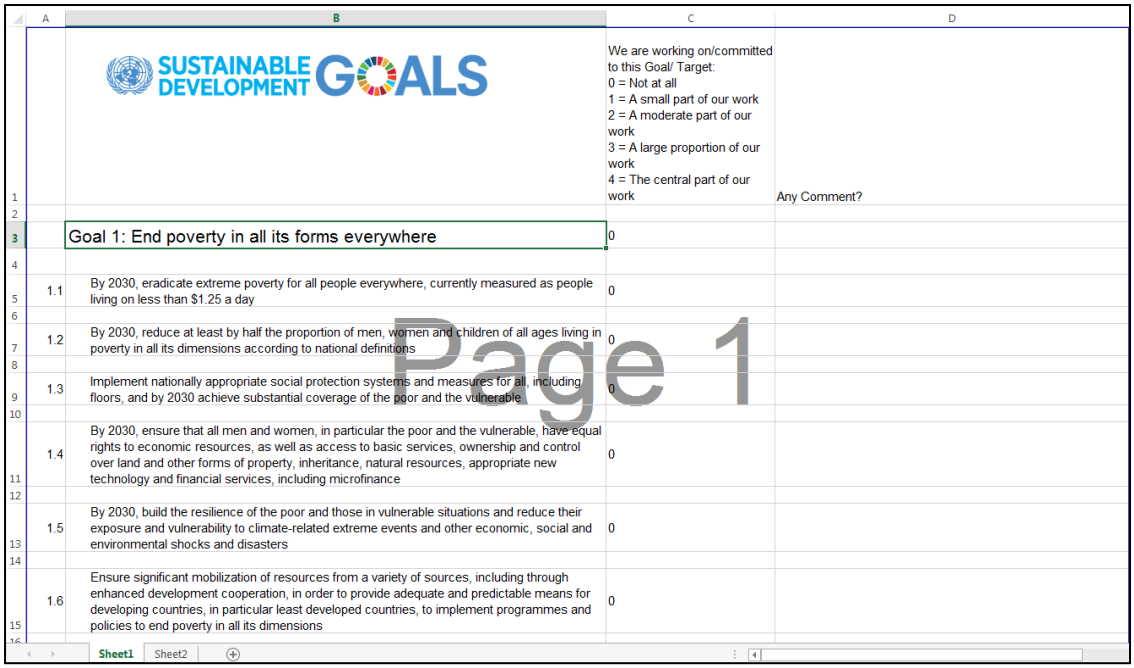
There are a potentially vast number of civil society organisations in New Zealand that may be working towards achieving the SDGs. This review has examined those that have a web presence, and have indicated that they are working on SDGs or related issues. Three organisations in New Zealand have worked together to launch a website promoting the SDGs – Piango, Hui E! and the Council for International Development (CID). The website, www.oursdgs.nz provides a brief overview of each of the goals and several global and regional links for further information.

3.5.1 Piango

Piango is the Pacific Island Association of Non-governmental Organisations, based in Fiji. New Zealand is a member of the association through the CID. The CID is the national umbrella agency of international development organisations based in New Zealand. It coordinates activities and presents a single, common voice on issues. Hui E! Community Aotearoa is an organisation that is dedicated to building strong community organisations to build a strong New Zealand. Hui E! brings together Tangata Whenua, community and voluntary sector.

3.5.2 Hui E!

Hui E! has set up an Excel file for community organisations to map their work against the SDGs and associated targets (Figure 5). They also request that the organisations send them a copy of the file so they can track them alongside other community groups in New Zealand. Information relating to the organisations that have sent in this sheet and their status has been requested, however no response has been received from Hui E! to date. Generally, Hui E! appears to provide information about the SDGs to its community audience, and organise events around the SDGs.



	A	B	C	D
1		SUSTAINABLE DEVELOPMENT GOALS	We are working on/committed to this Goal/ Target: 0 = Not at all 1 = A small part of our work 2 = A moderate part of our work 3 = A large proportion of our work 4 = The central part of our work	Any Comment?
2				
3		Goal 1: End poverty in all its forms everywhere	0	
4				
5	1.1	By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than $1.25 a day	0	
6				
7	1.2	By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions	0	
8				
9	1.3	Implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable	0	
10				
11	1.4	By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance	0	
12				
13	1.5	By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters	0	
14				
15	1.6	Ensure significant mobilization of resources from a variety of sources, including through enhanced development cooperation, in order to provide adequate and predictable means for developing countries, in particular least developed countries, to implement programmes and policies to end poverty in all its dimensions	0	

Figure 5. Screenshot of the Hui E! spreadsheet for New Zealand community organisations to map and track their work against the SDGs and associated targets.

3.5.3 Council for International Development (CID)

Sampling a large number of Council for International Development (CID) members from their website, a number had specific reference to the SDGs. Fairtrade Australia/New Zealand highlights, for example, how achieving zero hunger requires making trade fair. There is then reference to how Fairtrade's work intersects with each of the SDGs in some way, however, there are seven specific goals that they believe could be achieved through fairer trade. These include goals 2, 5, 8, 12, 13, 16, & 17 (Fairtrade, 2015).

3.5.4 New Zealand Family Planning

New Zealand Family Planning highlights that they work with the New Zealand parliamentarians group on Population and Development to keep them informed and updated on population and development issues, relating directly to SDG 3. ChildFund New Zealand provides advocacy around the SDGs, in particular goals 4, 5, 8, 11 & 16. Caritas Aotearoa-New Zealand also provides advocacy and works with partners around the Pacific on SDGs. Caritas also provides advocacy and work around poverty, social welfare, employment and housing in New Zealand. The goals related to this work include SDGs 1, 8, 10, 13 & 14.

3.5.5 World Wildlife Fund (WWF) New Zealand

The WWF New Zealand branch is involved in campaigns around climate change, sustainable fisheries and coastal management, partnerships with the private sector and providing educational materials. They make no explicit mention of the SDGs on their website, however, their work can be mapped to goals 4, 13, 14, & 17.

3.5.6 The United Nations Association of New Zealand

The United Nations Association of New Zealand (UNA NZ) is self-described as the people's movement for the United Nations in New Zealand. They promote the understanding, education and the engagement of the UN. They actively promote the work of the UN and the SDGs through symposiums, member events and public outreach. Further information is available on their website listed in the website references below.

4. Reference List

Allen, C., Metternicht, G., & Wiedmann, T. (2016). National pathways to the Sustainable Development Goals (SDGs): a comparative review of scenario modelling tools. *Environmental Science and Policy, 66*, 199-207.

Australian Government. (2017). *Foreign Policy White Paper*. Canberra: Department of Prime Minster and Cabinet.

Barbier, E. B., & Burgess, J. C. (2017). The Sustainable Development Goals and the systems approach to sustainability. *Economics: The Open-Access, Open-Assessment E-Journal, 11*, online.

Biermann, F., Kanie, N., & Kim, R. E. (2017). Global governance by goal-setting: the novel approach of the UN Sustainable Development Goals. *Current Opinion in Environmental Sustainability, 26-27*, 26-31.

Boas, I., Biermann, F., & Kanie, N. (2016). Cross-sectoral strategies in global sustainability governance: towards a nexus approach. *International Environmental Agreements, 16*, 449-464.

Bowen, K. J., Cradock-Henry, N. A., Koch, F., Patterson, J., Häyhä, T., Vogt, J. M., & Barbi, F. (2017). Implementing the "Sustainable Development Goals": towards addressing three key governance challenges - collective action, trade-offs, and accountability. *Current Opinion in Environmental Sustainability, 26*, 90-96.

Cawthron Institute. N.d. *Profile*. Nelson, NZ: Cawthron Institute.

Collste, D., Pedercini, M., & Cornell, S. E. (2017). Policy coherence to achieve the SDGs: using integrated simulation models to assess effective policies. *Sustainability Science, 12*, 921-931.

Dairy NZ (2017). DCANZ, DAIRYNZ and MPI endorse Dairy Declaration of Rotterdam. Retrieved form https://www.dairynz.co.nz/news/latest-news/endorsement-of-dairy-declaration/

Department of Foreign Affairs and Trade [DFAT]. (n.d.a). Voluntary National Review. Retrieved from http://dfat.gov.au/aid/topics/development-issues/2030-agenda/Pages/voluntary-national-review.aspx

DFAT. (n.d.b). Engaging business. Retrieved from http://dfat.gov.au/aid/topics/development-issues/2030-agenda/Pages/engaging-business.aspx

DFAT. (n.d.c). *Engaging civil society and universities*. Retrieved from http://dfat.gov.au/aid/topics/development-issues/2030-agenda/Pages/engaging-civil-society-and-universities.aspx

de Hart, D. (2017). Team science: A qualitative study of benefits, challenges, and lessons learned. *The Social Science Journal, 54*, 458–467.

De Pryck, K., & Wanneau, K. (2017). (Anti)-boundary work in global environmental change research and assessment. *Environmental Science and Policy, 77*, 203-210.

Die Bundesregierung. (2016). Deutsche Nachaltigkeitsstragie. Retrieved from https://www.auswaertiges-amt.de/blob/277182/16065e95a40b6eed95503bbc1dd06328/170117-nachhaltigkeitsstrategie-data.pdf

Environment and Climate Change Canada. (2016). *Achieving a Sustainable Future: A Federal Sustainable Development Strategy for Canada 2016-2019*. Ottawa: Environment and Climate Change Canada.

Environment and Climate Change Canada. (2017). *Achieving a Sustainable Future: A Federal Sustainable Development Strategy for Canada 2016-2019 – Spring 2017 Update*. Ottawa: Environment and Climate Change Canada.

Esquivel, V. (2016). Power and Sustainable Development Goals: a feminist analysis *Gender and Development, 24*(1), 9-23.

Fairtrade (2015). Sustainable Development Goals and Fairtrade: The Case for Partnership. Retrieved from https://www.fairtrade.net/new/latest-news/single-view/article/sustainable-development-goals-and-fairtrade-the-case-for-partnership.html

Family Planning New Zealand. (2017). Health and Gender Focus at Forum. Retrieved from http://www.familyplanning.org.nz/news/2017/health-and-gender-focus-at-sdg-forum

Fleming, A., M., W. R., Hansen, H., & Sams, L. (2017). The sustainable development goals: A case study. *Marine Policy, 86*(1), 94-103.

Hajer, M., Nilsson, M., Raworth, K., Bakker, P., Berkhout, F., de Boer, Y., Rockström, J., & Kok, M. (2015). Beyond cockpit-ism: four insights to enhance the transformative potential of the Sustainable Development Goals. *Sustainability, 7*, 1651-1660.

Hák, T., Svatava, J., & Moldan, B. (2016). Sustainable Development Goals: a need for relevant indicators. *Ecological Indicators, 60*, 565-573.

Hummel, D., Jahn, T., Keil, F., Liehr, S., & Stieß, I. (2017). Social Ecology as critical, transdisciplinary science—conceptualizing, analyzing and shaping societal relations to nature. *Sustainability, 9*, 1050.

International Council for Science [ICSU]. (2017). *A guide to SDG interactions: from science to implementation*. International Council for Science.

Institute for Advanced Sustainability Studies (2017). Science Platform Sustainability 2030. Retrieved from https://www.iass-potsdam.de/en/research/sdg-platform

Joshi, D. K., Hughes, B. B., & Sisk, T. D. (2015). Improving governance for the post-2015 Sustainable Development Goals: scenario forecasting the next 50 years. *World Development, 70*, 286-302.

Juntti, M., Russel, D., & Turnpenny, J. (2009). Evidence, politics and power in public policy for the environment. *Environmental Science and Policy, 12*, 207-215.

Lu, Y., Nakicenovic, N., Visbeck, M., & Stevance, A.-S. (2015). Five priorities for the UN Sustainable Development Goals. *Nature, 520*, 432-433.

Lennon, S. (n.d.). *The Sustainable Development Goals and Australia – A National and Personal Roadmap to Sustainability*. Perth: United Nations Association of Australia, Western Australia.

Mc Arthur, J. & Rasmussen, K. (2017). *Who and What Gets Left Behind? Assessing Canada's Domestic Status on the Sustainable Development Goals*. Working Paper 108, Washington D.C.: Brookings Institution.

McBean, G., & Martinelli, A. (2017). Blurring disciplinary boundaries. *Science, 358*(6366), 975.

Ministry for Foreign Affairs of Finland [Formin]. (n.d.). Agenda 2030-Sustainable Development Goals. Retrieved from http://www.formin.finland.fi/public/default.aspx?contentid=329379

MW LCR. 2017. *Our Land, Our Future: Tō tātou whenua, mō āpōpō*. Annual Report 2017. Lincoln, NZ: Manaaki Whenua Landcare Research.

New Zealand Labour Party & Green Party of Aotearoa New Zealand (2017). *Confidence and Supply Agreement.* Retrieved from https://www.greens.org.nz/sites/default/files/NZLP%20%26%20GP%20C%26S%20Agreement%20FINAL.PDF

New Zealand Ministry of Foreign Affairs and Trade [MFAT] (2016). New Zealand National Statement: High Level Political Forum on Sustainable Development.Retrieved from https://www.mfat.govt.nz/en/peace-rights-and-security/work-with-the-un-and-other-partners/new-zealand-and-the-sustainable-development-goals-sdgs/

Nilsson, M., Griggs, D., & Visbeck, M. (2016). Map the interactions between Sustainable Development Goals. *Nature, 534*, 320-322.

Nilsson, M., & Persson, Å. (2017). Policy note: Lessons from environmental policy integration for the implementation of the 2030 Agenda. *Environmental Science and Policy, 78*(1), 36-39.

Oldekop, J. A., Fontana, L. B., Grugel, J., Roughton, N., Adu-Ampong, E. A., Bird, G. K., Dorgan, A., Espinoza, M. A. V., Wallin, S., Hammett, D., Agbarakwe, E., Agrawal, A., Asylbekova, N., Azkoul, C., Bardsley, C., Bebbington, A. J., Carvalho, S., Chopra, D., Christopoulos, S., Crewe, E., Dop, M.-C., Fischer, J., Gerretsen, D., Glennie, J., Gois, W., Gondwe, M., Harrison, L. A., Hujo, K., Keen, M., Laserna, R., Miggiano, L., Mistry, S., Morgan, R. J., Raftree, L. L., Rhind, D.,

Rodrigues, T., Roschnik, S., Senkubuge, F., Thornton, I., Trace, S., Ore, T., Valdes, R. M., Vira, B., Yeates, N., & Sutherland, W. J. (2016). 100 key research questions for the post-2015 development agenda *Development Policy Review* (Vol. 34, pp. 55-82).

Paul, D. (2017) Finland Updates Parliament on National SDG Implementation. Retrieved from http://sdg.iisd.org/news/finland-updates-parliament-on-national-sdg-implementation/

Plant & Food Research. 2017. *Discover. Innovate. Grow. Science at Work*. Auckland: Plant & Food Research.

Prime Minister's Office. (n.d.). *Sustainable development*. Helsinki: Prime Minister's Office Finland.

Prime Minister's Office. (2016). *National report on the implementation of the 2030 Agenda for Sustainable Development: Finland*. Helsinki: Prime Minister's Office Finland.

Sachs, J., Schmidt-Traub, G., Kroll, C., Durand-Delacre, & Teksoz, K. (2017). *SDG Index and Dashboards Report 2017*. New York: Bertelsmann Stiftung and Sustainable Development Solutions Network (SDSN).

Saito, O., Managi, S., Kanie, N., Kaufman, J., & Takeuchi, K. (2017). Sustainability science and implementing the sustainable development goals. *Sustainability Science, 12*(6), 907-910.

Spaiser, V., Ranganathan, S., Swain, R. B., & Sumpter, D. J. T. (2017). The sustainable development oxymoron: quantifying and modelling the incompatibility of sustainable development goals. *International Journal of Sustainable Development and World Ecology, 24*(6), 457-470.

Stafford-Smith, M., Griggs, D., Gaffney, O., Ullah, F., Reyers, B., Kanie, N., Stigson, B., Shrivastava, P., Leach, M., & O'Connell, D. (2017). Integration: the key to implementing the Sustainable Development Goals. *Sustainability Science, 12*, 911-919.

Statistics NZ [Stats NZ]. (n.d.). NZ Progress Indicators. Retrieved from http://archive.stats.govt.nz/browse_for_stats/snapshots-of-nz/nz-progress-indicators/Home.aspx

United Nations. (2015). Transforming Our World: The 2030 Agenda for Sustainable Development. Retrieved from https://sustainabledevelopment.un.org/post2015/transformingourworld/publication

Van der Hel, S., & Biermann, F. (2017). The authority of science in sustainability governance: a structured comparison of six science institutions engaged with the Sustainable Development Goals. *Environmental Science and Policy, 77*, 211-220.

Vasseur, L., Horning, D., Thornbush, M., Cohen-Shacham, E., Andrade, A., Barrow, E., Edwards, S. R., Wit, P., & Jones, M. (2017). Complex problems and unchallenged solutions: bringing ecosystem governance to the forefront of the UN sustainable development goals. *Ambio, 46*, 731-742.

Yonehara, A., Saito, O., Hayashi, K., Nagao, M., Yanagisawa, R., & Matsuyama, K. (2017). The role of evaluation in achieving the SDGs. *Sustainability Science, 12*, 969-973.

5 List of websites consulted

(In alphabetical order)

https://z.co.nz/about-z/what-matters/sustainability/
https://www.airnewzealand.co.nz/sustainability
https://apps.mngt.waikato.ac.nz/Newsroom/Article/3690
https://www.auckland.ac.nz/en/about/the-university/how-university-works/sustainability-and-environment/se-whats-new_1/se-whats-new-2016/advancing-our-commitment-to-global-sustainable-development-goals.html
https://www.auckland.ac.nz/en/about/the-university/how-university-works/sustainability-and-environment/se-whats-new_1/se-whats-new-2017/leading-the-charge-towards-global-goals.html
http://www.aut.ac.nz/about-aut/sustainability-at-aut
http://www.aut.ac.nz/about-aut/sustainability-at-aut/who-is-involved
http://www.aut.ac.nz/community/pacific/our-gallery
http://www.aut.ac.nz/community/pacific/pacific-language-weeks/cook-island-language-week
http://www.aut.ac.nz/study-at-aut/campuses/south-campus/south-campus-goals-series
http://www.aut.ac.nz/study-at-aut/study-areas/law/featured-news-and-events-items/achieving-the-sustainable-development-goals-leadership-symposium-inspires-action
https://www.callaghaninnovation.govt.nz/about-us/our-role
http://www.canterbury.ac.nz/media/documents/research/NZ%E2%80%99s-aid-policy.pdf

http://www.canterbury.ac.nz/media/documents/reports/UC-Stakeholder-Update-April-20161.pdf
http://www.canterbury.ac.nz/ncre/seminars/2016-seminars/
http://www.caritas.org.nz/advocacy/poverty
http://www.caritas.org.nz/newsroom/media-releases/caritas-calls-halt-deep-sea-mining
http://www.caritas.org.nz/newsroom/stories/global-common-good-not-national-interest-required-climate-change
https://www.childfund.org.nz/news-and-stories/taking-action-to-change-the-world
http://www.cid.org.nz/about-2/about-cid-celebrating-30-years/
http://www.confer.co.nz/sdg2018/
https://www.dairynz.co.nz/news/latest-news/endorsement-of-dairy-declaration/
http://www.eds.org.nz/keep-in-touch/blog/2016/fresh-focus-needed-on-climate-change-governance/
http://www.eds.org.nz/keep-in-touch/blog/2016/sciblogs-part-4-conservation-its-a-private/
http://www.eds.org.nz/keep-in-touch/blog/2016/sciblogs-part-9-vision-biodiversity-loss/
https://www.esr.cri.nz/home/about-esr/media-releases/finding-sustainable-solutions-to-clean-our-water/
https://www.fairtrade.net/new/latest-news/single-view/article/sustainable-development-goals-and-fairtrade-the-case-for-partnership.html
http://fairtrade.org.nz/News/News/Archive/BLOG-The-Hunger-Games
http://www.familyplanning.org.nz/about/our-work/international/working-with-parliamentarians
https://www.fmhs.auckland.ac.nz/en/faculty/about/multimedia-gallery/faculty-events/un-week-2017.html
http://www.huie.org.nz/about/
http://www.huie.org.nz/thinking-pieces/hui-e-and-the-un-sustainable-development-goals/
http://www.huie.org.nz/thinking-pieces/sustainable-development-goals/
https://indd.adobe.com/view/ba876813-8fcc-4c0a-bff9-bd8dae07b0aa
https://www.landcareresearch.co.nz/science/ambitions
http://www.lincoln.ac.nz/ird
https://www.massey.ac.nz/massey/about-massey/news/article.cfm?mnarticle_uuid=816ED3F0-E30A-D79A-CD3C-32008708D274
https://www.mpi.govt.nz/funding-and-programmes/farming/sustainable-land-management-and-climate-change-research-programme/
https://www.niwa.co.nz/climate/research-projects/developing-a-national-climate-change-adaptation-plan-for-new-zealand
http://www.otago.ac.nz/business/news/otago671546.html
http://www.otago.ac.nz/iceerb-2018/index.html
http://www.otago.ac.nz/otago-connection/otago605402.html
http://www.otago.ac.nz/wellington/departments/publichealth/news/otago652630.html
http://oursdgs.nz/
http://www.sbc.org.nz/
https://sustainable.org.nz/about-sbn/
http://www.scionresearch.com/about-us/about-scion/corporate-publications/scion-connections/scion-connections-2/scion-connections-issue-26,-december-2017/sustainable-wood-for-sustainable-development
http://www.treasury.govt.nz/downloads/pdfs/oia/oia-20160351.pdf

http://www.treasury.govt.nz/abouttreasury/higherlivingstandards
http://www.unanz.org.nz/
http://unsdsn.org/about-us/vision-and-organization/
https://www.victoria.ac.nz/__data/assets/pdf_file/0007/909340/sustainable-development-goals.pdf
https://www.victoria.ac.nz/explore/study-areas/development-studies/overview
https://www.victoria.ac.nz/news/2017/06/victoria-leads-in-commitment-to-sustainable-development-goals
https://www.victoria.ac.nz/news/2017/08/guide-for-universities-sustainability-journey
http://www.waikato.ac.nz/study/qualifications/master-of-maori-and-pacific-development
https://www.wwf.org.nz/about_us/business_partners/index.cfm
https://www.wwf.org.nz/take_action/zero_carbon_act/index.cfm
https://www.wwf.org.nz/what_we_do/education/resources_for_teachers/index.cfm
https://www.wwf.org.nz/what_we_do/marine/sustainable_fisheries/raising_awareness/index.cfm
https://vectorwebstoreprd.blob.core.windows.net/blob/vector/media/vector/sustainability-policy-2017-2019.pdf

Appendix C
About the team

Roa Petra Crease
Roa is a post-graduate researcher with a Master of Science in Human Geography. Her research interests are in climate change adaptation, environmental management and feminist political ecology. Roa also holds a Bachelor of Science (B.Sc.) in Geography and Environmental management and a Bachelor of Science (Hons) in Geography from The University of Auckland.

Dr. Karen Fisher
Karen is a Human Geographer interested in society-environment interactions at The University of Auckland. Karen's research is focused on sustainable development and sustainability. She has conducted research in the Philippines focused on the sociopolitical dimensions of water governance and development with a particular interest in the role of local government in mediating the needs of local communities with national objectives. Since 2012, Karen has been involved in collaborative transdisciplinary research projects that focus on knowledge production for sustainability in the context of marine environments and urban water. Karen is also interested in exploring the methodological issues that arise in the conduct of development-oriented research.

Dr. Stephen Flood
Stephen has over 10 years' experience in climate change, environmental policy and social science research. He is based at Manaaki Whenua – Landcare Research and has an adjunct research position at Victoria University of Wellington. His research interests include communicating climate change adaptation and behavioural change, the 2030 Agenda for Sustainable Development, resilience and systems thinking, coastal management, climate change adaptation and decision-making, vulnerability assessment and hazard management.

Dr. Peter Edwards
Peter is a Political Scientist based at Scion's Forest Systems, Policy and Economics Group. Peter's research interests are in governance, climate change, public policy analysis and international politics. He is also interested in natural resource management, citizen participation, forest ecology, and local governance.

Stephan Rupp
Stephan is a Building Physicist based at BRANZ in Wellington. He holds a BSc(Hons) and MSc in Physics from Victoria University of Wellington. He has 20 years' experience in research and development in the fields of High-Temperature superconductors and the industrial production of crystalline solar cells. He is also active in the United Nations Association of New Zealand.