


# CONCO>E TŪHURA

**Building the business case for professional  
environmental training – a Phase 1 landscape  
scan**



**Clare Feeney | August 2023**



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Foster the pathway of knowledge to strength, independence and growth for future generations.

— Troy Brockbank, Kaitohutohu Matua Taiao / Senior Environmental Consultant at WSP Opus

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### *Learning for Life on Earth*

*Environment and Sustainability Strategic Training Institute*

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## DECLARATION OF INTEREST

I am a long-time member of Water New Zealand and WasteMINZ, and I also belong to Civil Contractors New Zealand (as an associate member) and Carbon and Energy Professionals. These are the four industry associations who took part in this project. I am also a long-term member of the Australasian Branch of the International Erosion and Sediment Control Association (IECA). I am a member of Engineering New Zealand (through its Sustainability Society) and a recent member of CIWEM, the Chartered Institution of Water and Environmental Management. I am also a long-term member of NZATD, the New Zealand Association of Training and Development and PSANZ, the Professional Speakers Association of New Zealand.

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## EXECUTIVE SUMMARY

## SECTION 1: ABOUT THE PROJECT

## One key finding

- Industry associations play a pivotal role in workforce planning for a sustainable future.
- They are a vital contributor to the skills development work being done by government agencies.
- A focus on vocational and university learning overshadows the role of continuing professional development.

## A perfect storm

- The world faces threats of climate change and ecosystem collapse as well as significant infrastructure deficits.
- Aotearoa New Zealand also faces a severe local and global skills shortage that immigration alone cannot fix.
- To meet Government environment & infrastructure outcomes, we must lift the skills of the current workforce.

## SECTION 2: STAKEHOLDERS AND THEIR RELATIONSHIPS

## Many stakeholders

- A few industry associations are home to the skills at the heart of environmental and infrastructure reforms
- A larger number of specialised associations focus on these and related skills
- There are many Government bodies with responsibilities for environmental and infrastructure matters.

## SECTION 3: INDUSTRY CAPABILITY TO DELIVER REQUIRED GOVERNMENT OUTCOMES

## Outcomes &amp; capability

- Industry associations have invested significant effort into submissions on Government legislation and policies.
- Outcomes focus on climate change, biodiversity, water, natural and built environments, waste minimisation and infrastructure.
- Project participants all identify many important gaps in the skill required to deliver these outcomes

## Skills in common

- Carbon, water and waste flow throughout the entire economy. Participants have core specialist skills, but all need more general skills to effectively address all these flows. This opens opportunities to share skills.
- All participants deliver some training and are planning more. Te ao Māori & other holistic themes are shared.
- The training participants plan must be visible if it is to be accessible to those who need it or who can offer it.
- Industry fatigue poses a threat to industry's ability to deliver on required Government outcomes.

## SECTION 4: LEARNINGS FOR PHASE 2 ENVIRONMENTAL CAPABILITY

## Learnings for Phase 2

- The many players in the education and training space do not fit together to form into a static jigsaw
- Environmental science, technology and management tools are fast-moving so there will always be a need for continuing professional development of everyone in the environmental workforce in an ongoing demographic dance of professional, vocational and university learners taking their turns on the floor all their working life
- Research questions focus on how we might work together and align and measure training outcomes.

## SECTION 4: LEARNINGS FOR PHASE 2 ENVIRONMENTAL CAPABILITY

## Next steps

- As a collaborative project we plan a collaborative response to Phase 1 and a collaborative approach to preparing and taking part on Phase 2 – the preparation of a business case for funding of continuing professional development of the environmental and infrastructure workforce.
- We will send this report to participating organisations and present a 1-hour webinar to ask for their feedback
- Then we will prepare a draft proposal for Phase 2 and seek more input before applying for Phase 2 funding.

## 1. THE PROJECT

### 1.1 The context: a perfect storm

The world is grappling with unparalleled and swift changes due to the looming threats of climate change and ecosystem collapse. In Aotearoa New Zealand, multiple government initiatives are addressing these concerns, along with the environmental impacts stemming from insufficient built infrastructure. However, this approach creates a heavy workload for the environmental workforce—both professionals and those in vocational roles—across sectors. This burden comes at a time when there's a critical shortage of expertise at local and global levels that can't be solved by immigration alone.

Meeting the targeted outcomes of current government reforms—water, climate change, resource management, infrastructure, and waste—in a competitive global skills market requires an urgent enhancement of existing skills. Vocational education reforms emphasize sustainability, but it takes years for graduates to contribute effectively, and even more time for their skills to mature through workplace experience.

Meanwhile, experienced professionals already in the workforce are recognizing the need for new specialized skills due to legislative changes. However, their development needs aren't addressed, even though their skills could be boosted faster than traditional education pathways.

The assessment of professional training needs is integral to understanding vocational training requirements, as demonstrated by the US-based National Green Infrastructure Certification Program (NGICP), which broadened its scope to include infrastructure designers' training.

Various government reports repeatedly highlight terms like skills, training, capacity, and education, yet specific actions are scarce. A comprehensive continuing professional development (CPD) strategy is missing, one that identifies and develops the interconnected skills needed by environmental professionals to achieve government goals. This strategy would also inform the development of complementary vocational skills. Addressing this CPD gap (Gap 1) is the focal point of my work.

### 1.2 Who this report is for

This report targets ConCOVE, the Construction and Infrastructure Centre of Vocational Excellence, as its client. It contributes to the foundational support required to enhance environmental and sustainability skills in New Zealand. The report also serves various stakeholders involved in education, training, and workforce oversight, including Waihanga Ara Rau, the Regional Skills Leadership Groups, Tertiary Education Commission, Te Pūkenga, and universities, along with other agencies and groups providing environmental training.

### 1.3 Revealing the overlooked

The world faces change at unprecedented scale and pace from the effects of climate change and ecosystem collapse<sup>1</sup>. Multiple government initiatives in Aotearoa New Zealand seek to address these issues together with the significant environmental impacts of our built infrastructure deficits.

However, this presents the environmental workforce – professional and vocational – across these sectors with a massive workload at a time of acute local and global shortages of capacity and capability that immigration alone cannot possibly address.

If we are to meet the targeted outcomes of current government reforms affecting water, climate change, resource management, infrastructure and waste, in a globally competitive market for the scarce skills we need, we must urgently and effectively lift the skills of the people we have.



The reform of vocational education has a strong sustainability focus, and schools and universities are coming to terms with their emerging educational role on climate change and other environmental and sustainability issues. However it takes several years for these educational pipelines to deliver their graduates, and it takes several more years of workplace mentoring for their skills to mature.

In the meantime, the vastly greater numbers of experienced practitioners already in the workforce are identifying the new and more specialised skills they urgently need to step up to multiple legislative and policy changes. However, their professional development needs are not specifically provided for, even though their skills can be boosted much more rapidly than tertiary training and education pathways can deliver.

Moreover, the assessment of professional training needs is integral to understanding vocational training needs. This was evidenced by the US-based Water Environment Federation's National Green Infrastructure Certification Program<sup>2</sup> (NGICP), which initially targeted construction workers, but was rapidly updated to include the training needs of the professionals who design the infrastructure that construction workers build.

Multiple government reports on climate change, three waters, resource management reform, freshwater, construction and infrastructure repeatedly use terms like skills, training, capability, capacity, workforce, skills and education, but only one of them has suggested any specific action.<sup>3</sup>

There is no comprehensive continuing professional development (CPD) strategy to identify, develop and deliver the interrelated skills that environmental professionals need to deliver the Government's required outcomes. Such a strategy would also inform the development of the vocational skills that interweave with their own. Addressing this CPD gap (Gap 1) is the focus of my work.



CPD supports ongoing learning in the workplace, regardless of qualification level. My focus is on the potential of environmental training for practitioners to meet urgent skills growth.

#### 1.4 Project phases, approach, participants and methods

This project is the first of two phases conducted in collaboration with key industry associations:

1. Phase 1: A landscape scan identifying relevant legislation, policies, and stakeholders, paving the way for Phase 2.
2. Phase 2: An environmental capability project collaborating with industry associations to design a collaborative CPD training strategy.

The project aims to prevent Phase 2 from becoming too expansive. This phase closely engages with key associations to understand their legislative drivers and members' needs. A targeted group of industry associations (Carbon and Energy Professionals, Civil Contractors New Zealand, WasteMINZ and Water New Zealand, guides the project.

I chose these associations because they intertwine water and carbon in their work, connecting materials, waste, ecology, and impacts. Despite diverse disciplines, environmental processes unite them. This interdependence facilitates transdisciplinary knowledge sharing, optimizing outcomes, and cost-effective monitoring. This group includes horizontal, not vertical construction. Vertical construction aligns with BRANZ's 'The Future of Work' project, which shares insights.

This practical investigation focuses on practitioner groups, aiming for pertinent, applicable findings, not an exhaustive academic review of environmental regulations.

We must therefore view issues and solutions from a process rather than a purely functional, institutional, siloed perspective.

I believe this interconnectedness will open up opportunities to share transdisciplinary expertise in a way that benefits all participants, avoids leaving gaps or duplicating effort, optimises outcomes and lends itself to more cost-effective integrated outcome monitoring.

This group includes representatives of horizontal construction, but not vertical construction. BRANZ, the Building Research Association of New Zealand, is doing similar work with the vertical construction sector through its project, 'The Future of Work: what do we know and what do we need to know to transition to zero carbon construction'. The two projects, (horizontal and vertical) will be sharing information with each other.

My methodology involved working closely with the four industry associations listed above to deliver the project deliverables described in the next section.



This applied investigation works with groups representing practitioners. It is not a rigorous academic review of all environmental legislation and policy. My pragmatic approach aims to produce targeted findings that busy professionals can easily apply.

### 1.5 Phase 1 project deliverables

The required deliverables of this Phase 1 Landscape Scan project are:

- D1: a list of key environmental and infrastructure stakeholders and how they relate to each other;
- D2: a list of the Government legislation, policy and other initiatives that are directly relevant to the water, infrastructure, resource management and climate change reforms that affect the work of ConCOVE and key industry associations and other stakeholders;
- D3: an overview on how each industry association views its capability and capacity to deliver the work needed to deliver the outcomes described above; and
- D4: a set of recommendations that inform the scope, outcomes and workplan of the Phase 2 Environmental Capabilities Project, including scoping an outcome monitoring framework.

This Phase 1 also report lists matters that cannot be addressed here, but should not be forgotten. These and any recommendations for further action are detailed in **Section 6.7**.

### 1.6 Clarifying terminology

The terms 'skills', 'training', 'capability', 'capacity', 'workforce' and 'education' appear throughout the many Acts, Bills, submissions and reports relevant to this Landscape Scan. They seemed to be used more or less interchangeably. In the civil construction, water, waste, carbon and biodiversity sectors with which I am familiar, professionals are strongly expressing the CPD training needed to address the requirements of the many new environmental laws, policies, regulations and other initiatives to which they must now give effect. In my work I therefore distinguish between:

- **capability**, referring to knowledge and skills we need to address our infrastructure deficit; and **capacity**, the headcount of people we need with that knowledge and those skills (note that I use the term 'capability' in the general sense, not as strictly defined by tertiary educators;
- **education**, in the sense of gaining a qualification from a polytechnic or university; and **training** in the sense of ongoing workplace-based training, both professional and vocational;
- **education** as defined above also including education in primary and secondary schools; as distinct from public **information** and **engagement**; and
- **vocational training**, referring to the trade qualifications gained from tertiary training and various options for ongoing workplace training; and professional training, which relates to

**continuing professional development**, or CPD, of professional and vocational employees throughout the workforce.

Multiple recent workforce deficit analyses exist, some in References. These analyse industry capacity and role descriptions, e.g., project managers. Infrastructure workforce shortfall estimates cover professionals and vocational roles. Deloitte predicts 5,849 to 9,260 FTE jobs from Govt. investment, but attracting and retaining staff is a challenge in construction. Deloitte notes immediate pressure on water consultancy expertise. Migration might help near-term skill shortages. Water NZ's 2050 vision stresses upskilling for three waters workforce alignment. I use 'skills' and 'capability' for environmental areas like ecology, carbon accounting, etc. These are lacking in comprehensive industry documentation for Govt. outcomes. Addressing this gap (Gap 3) is this project's focus. Section 4 reveals Water NZ's surveys on vital skills. I analysed stormwater skills, with other analyses planned in Phase 2. Phase 1 describes industry associations' capacity to achieve Govt. goals, guiding Phase 2.

As will be shown in **Section 4**, in response to practitioners' concerns about emerging and urgently needed skills, Water New Zealand conducted three membership surveys. Drawing on the list of skills they identified, I carried out just such a detailed skills analysis for stormwater<sup>4</sup>, and I aim to develop similar analyses of other core environmental and infrastructure disciplines in Phase 2 of this work. This Phase 1 work informs Phase 2 by summarising how participating industry associations describe their own capability and capacity to deliver on Government outcomes.

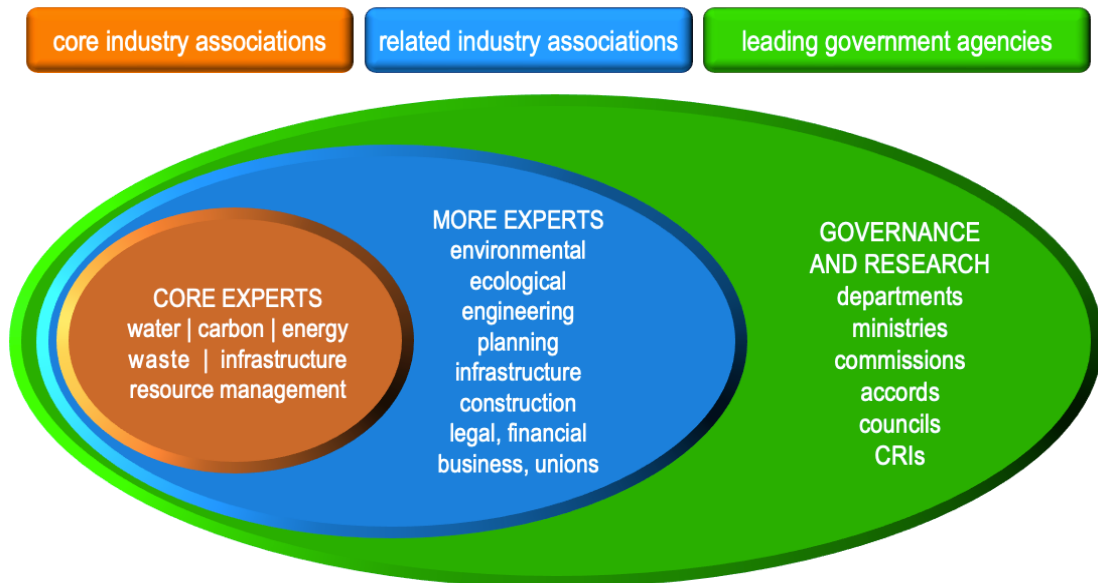
“ Industry training may be defined, like learning, as ‘a key organizing process for improving the [capability and] capacity of individuals, teams, organizations and networks to achieve their sustainability goals.’ Dr Melanie Feeney<sup>5</sup>

## 2. D1 STAKEHOLDERS AND THEIR RELATIONSHIPS

This section provides the initial output required by the Landscape Scan project (**Section 1.4**) – a list of key environmental and infrastructure stakeholders and their interconnections.

**Figure 1** illustrates three primary groups: core industry associations with direct links to government reforms, specialized associations with broader skills, and government bodies overseeing implementation and research.

Figure 1 Nested groups of environmental and infrastructure skills stakeholders



Many professionals join multiple industry associations in the orange and blue groups; their employers also join others. Common skills include engineering and recent environmental/resource management degrees. Members work in consulting, government, non-profits, and research. These associations provide a unified voice and skill development through events.

**Table 1** lists stakeholders alphabetically, but more may be missing. A significant concern is the lack of a central body representing ecological and biodiversity skills vital to industry associations in this report, hampering the environmental sector's alignment with government objectives. We aim to address this gap (Gap 4) for Phase 2's success.



It's complicated! Everything in the environment is connected to everything else, but everything we do with the environment, including skills, is infinitely segmented.

Table 1 Lists of environmental and infrastructure skills stakeholders

<b>CORE INDUSTRY ASSOCIATIONS: Carbon and Energy Professionals; Civil Contractors New Zealand; WasteMINZ; Water New Zealand</b>			
<b>RELATED INDUSTRY ASSOCIATIONS</b>		<b>LEADING GOVERNMENT AGENCIES</b>	
1. ACENZ: Association of Consulting Engineers NZ	18. LGNZ: Local Government NZ	1. Ara Ake	18. MfE: Ministry for the Environment
2. Apōpō (IPWEA: Institute of Public Works Engineering Australasia)	19. Marine Science Society	2. BRANZ: Building Research Association of NZ	19. MPI: Ministry for Primary Industries
3. AWIS: Association of Women in Science	20. NAWIC: National Association of Women in Construction	3. CIP: Crown Infrastructure Partners	20. NEMA: National Emergency Management Agency
4. Business New Zealand	21. NZARM: NZ Council of Trade Unions	4. Climate Change Commission	21. NIWA: National Institute of Water and Atmosphere (CRI)
5. CAANZ: Chartered Accountants Australia and New Zealand	22. NZGBC: NZ Green Building Assn	5. ConCOVE: Construction & Infrastructure Centre of Vocational Excellence	22. PCE: Parliamentary Commissioner for the Environment
6. CIWEM: Chartered Institution of Water and Environmental Management	23. NZILA: NZ Institute of Landscape Architects	6. Construction Sector Accord	23. Productivity Commission
7. Coastal Society	24. NZIS: NZ Institute of Surveyors	7. DOE: Department of Education	24. Regional Councils (11)
8. EcoSoc: NZ Ecological Society	25. NZPI: NZ Planning Institute	8. DIA: Department of Internal Affairs	25. Statistics NZ
9. EIANZ: Environmental Institute of Australia and NZ	26. Regional Sector Special Interest Group (SIG) Network, with 25 specialist groups	9. DoC: Department of Conservation	26. Taumata Arowai
10. Engineering New Zealand	27. RMLA: Resource Management Law Association	10. EECA: Energy Efficiency and Conservation Authority	27. Te Pukenga
11. Freshwater Society	28. Surface Water Integrated Management (SWIM) SIG	11. Energy Academy	28. Territorial authorities (61, excluding unitary councils)
12. Groundwater Forum	29. SBN: Sustainable Business Network	12. EPA: Environmental Protection Agency	29. Tertiary Education Commission
13. HydroSoc: NZ Hydrological Society	30. SBC: Sustainable Business Council	13. ESR: Institute of Environmental Science and Research (CRI)	30. Te Uru Kahika - Regional and Unitary Councils Aotearoa
14. IANZ (International Accreditation New Zealand)	31. Taituarā: Association of Local Government Professionals	14. Te Waihangā InfraComm (Infrastructure Commission)	31. Toitū Envirocare
15. IECA: International Erosion Control Association	32. Trade and Industrial Waste Forum	15. Just Transition Unit	32. Treasury
16. Infrastructure NZ	33. UDINZ: Urban Development Institute of New Zealand	16. Manaaki Whenua Landcare Research (CRI)	33. Unitary councils (6)
17. ISCA: Infrastructure Sustainability Council Australasia	34. Water Industry Operators Group	17. MBIE: Ministry of Business, Innovation and Employment	34. Waka Kotahi: New Zealand Transport Agency
	35. Wetlands Society		35. Waihangā Ara Rau: Construction and Infrastructure Workforce Development Council
	36. Zero Waste Network		36. Water Services Entities (10 to come)

Some not-for-profits are difficult to classify, such as the [Sustainable Business Network](#) and the [Sustainable Business Council](#). Like the industry associations, they are membership organisations and deliver environmental training to members, but while their staff are environmental experts, not all their members are. Nevertheless, they play a valuable role in the skills landscape and so I've included them.

Some bodies have mixed affiliations and roles, including being wholly-owned but independently-operating subsidiaries of business or government agencies, such as Toitū Envirocare (part of Manaaki Whenua Landcare Research), which trains its own clients and offers training through CEP. Other organisations deliver training towards professional or other certifications, such as the Infrastructure Sustainability Council, which certifies both trainees and the infrastructure they build. I have included ISC, but I have not included other product eco-labelling bodies such as Eco Choice (formerly Environmental Choice).

Not included in the lists are environmental not-for-profit bodies such as Forest & Bird, the Environmental Defence Society, Greenpeace, New Zealand Climate Action Network and many more<sup>6</sup>. These bodies produce a significant literature and body of action, but are not specifically focused on workforce capability and capacity.

An exception is Forest & Bird's summary of the skills needed across different sectors of the economy to protect biodiversity.<sup>7</sup> This is one of the few genuinely strategic overviews of Aotearoa's sustainability capability needs.

The large (and likely incomplete) number of stakeholders in **Table 1** makes it difficult to map every set of relationships. Broadly, however, **Figure 2** describes two main groups and functions:

- **government bodies** which inform the development of government legalisation and policy and have varying kinds and degrees of responsibility for managing their implementation; and
- **industry bodies** which support their members in a wide range of ways, including representing their views to government at all levels and helping them interpret what new legalisation and policy mean for their day-to-day work. As environmental and infrastructure issues become more serious, industry capability and capacity has become an increasingly important focus for these groups.

Environmental and infrastructure professionals work across all these groups and the specialists among them need the same sets of skills. Moreover, the environmental world in Aotearoa New Zealand is a small one, so there are many professional connections within and between each group, as well as a high degree of mobility of environmental professionals within and between them.

### 3. D2 (1) LEGISLATION AND POLICY OF INTEREST TO PROJECT PARTICIPANTS

This section delivers part of the second required output of this Landscape Scan project noted in **Section 1.4**, namely a list of the Government legislation, policy and other initiatives that are directly relevant to the water, infrastructure, planning and climate change reforms that affect the work of ConCOVE and key industry associations.

It also identifies the high-level outcomes of the core legislation and policy relating to the Government's environmental and infrastructure goals required to align the industry skills with these.

#### 3.1 Making submissions: meeting Government requests for industry input

The staff and members of the core industry associations involved in this report above have invested considerable time and effort over many years into making submissions on Government legislative, policy and strategy directly relating to their work – and to their capability and capacity to deliver Government outcomes.

Government invites this feedback and industry sees it as very important to have this input. Government and industry both want to ensure that legislation and policy actually enables the industry to tackle the problems, and in a measurable and cost-effective way.

In this section I briefly overview the participants' effort involved in responding to Government requests for submissions before listing and analysing the legislation and policy initiatives found to be most relevant.

##### 3.1.1 The Government requests

**Appendix B** shows that in response to Government legislation, policy and related initiatives:

- CEP has made 19 submissions in the last three years;
- CCNZ has made 44 submissions in the last five years;
- WasteMINZ's eight sector groups have made a total of 65 submissions in the last five years on 26 consultations<sup>8</sup>; and
- Water New Zealand has made 91 submissions in the last eight years.

A stand-out feature of the submissions and other comments reviewed reveals the amount of work involved in making just one submission, which may be anything from 5-20 pages long:

- firstly, reading long, complex and in some cases poorly drafted documents that may seek very specific feedback from stakeholders, including one that posed 53 questions seeking industry response;
- secondly, drafting a response and asking for members' feedback;
- thirdly, accommodating members' specialised and sometimes divergent views into a final version; and
- sometimes fourthly, preparing and presenting an overview to the select committee or body concerned.

##### 3.1.2 To submit or not to submit?

This project aimed to discover if exclusions (decisions not to make a submission on a given government initiative) were purposeful and informed. I therefore asked the project participants if they had formulated any criteria to help them decide what initiatives they would not submit on, and found they use a basic 'stop-go filter':

1. Is this initiative relevant to our sector?
2. Is it a priority for us?
3. Is there committee/member/subgroup interest?
4. Do we have the capacity to respond?

The first two questions would provide a fairly clear stop/go answer, while the second two would indicate the level of detail and content required. Hence, submissions are only made if they pass all four filters.

That said, some participants referred to 'submission fatigue' and one noted:

‘There is so much going on in this space that everyone is tapped out. This industry fatigue could impact on the overall success of projects. You can regulate for anything you like, but regulation will not necessarily lead to increased promotion or compliance.’

### 3.1.3 The industry effort

In sum, the Government recognises the invaluable role of industry associations in giving it access to expert technical input as well as views on the implementation aspects of its proposals. One project participant informally advised that they reluctantly decided they simply didn’t have the capacity to respond to a relevant and important piece of legislation. However, a representative of the Government agency concerned phoned the CEO and specifically asked the association to make a submission, drawing upon the highly valued expertise of their members. The CEO ended up paying an already-overstretched member to prepare the submission.

However, such is the pace of ongoing reform that these associations are working very hard to keep up. In fact, several more requests for submissions emerged and several more were prepared during the few weeks in which this report was finalised. As environmental pressures intensify and continue to damage key infrastructure, the pace of Government legislation and policy is unlikely to significantly ease, and the pressure on these industry associations is likely to remain at a high level.

Why is this important? Making submissions is very important to the effectiveness of Government reforms, but the burden of time compromises these associations’ already stretched capacity to develop the industry training their members are calling for.

Moreover, as the balance of the national effort shifts from developing legislation and policy towards its implementation and evaluation, the work of these industry associations will continue to grow in volume and importance.

## 3.2 What environmental and infrastructure outcomes does the Government seek?

As changes to environmental legislation and policy come into effect, industry and government bodies need to upskill their staff as outlined in the preceding section, to ensure they can meet the Government’s objectives and defined outcomes. A summary of the Government’s high-level environmental and infrastructure outcomes is needed to do this.

The many pieces of legislation, policy and other initiatives in **Figure 3** and **Appendix B** reveal a multi-pronged approach to one goal: sustainability. But there are too many of them to do a full statutory analysis to identify outcomes for each one.

I have simplified the crowded governance landscape by identifying just seven outcome areas that are the focus of core government initiatives that (together with many related acts, bills, policies and other initiatives) inform the work of the project participants. This will also serve to simplify the skills analysis in the next section.

Several submissions mention biodiversity, so I have included the 2020 Aotearoa New Zealand Biodiversity Strategy and the 2023 National Policy Statement for Indigenous Biodiversity. Water New Zealand made a submission on the former, but the latter was gazetted on 7 July 2023 while this report was being written. It has already attracted concern about the capability and capacity of the hard-pressed local government sector:

‘A biodiversity expert is urging the Government to make sure councils have enough support to carry out ambitious new roles to protect native flora and fauna. New indigenous biodiversity standards which came into force last week aim to give councils clearer direction on how to identify manage and protect significant natural areas where biodiversity is declining. Councils have five years to identify these areas and then they’ll have to enforce the new rules. Landcare Research Chief Scientist Dr Duane Peltzer says he is concerned how well resourced councils will be to follow through with the new guidelines.’<sup>9</sup>

**Table 2** lists the high-level outcomes of the six identified core government initiatives relating to the Government’s environmental and infrastructure goals. I have listed these in alignment with the priorities in the World Economic Forum’s 2023 global risk assessment<sup>10</sup>:



- climate change;
- biodiversity;
- water;
- natural and built environments;
- waste minimisation; and
- infrastructure.

This analysis aligns well with the key areas identified by the Parliamentary Commissioner for the Environment in his 2022 report, *Environmental reporting, research and investment: do we know if we're making a difference?*<sup>11</sup>

Carbon threads through all outcome areas, including waste from horizontal and vertical infrastructure, impacting biodiversity and climate change. CEP's programs ensure consistent carbon and energy expertise across all sectors. Similarly, water, biodiversity, and waste experts need standardized training, especially in leadership and membership.

These areas are influenced by te ao Māori and Mātauranga Māori knowledge, often embedded in legislation and practices. Māori and non-Māori professionals acknowledge the need for capacity and capability in these areas.

This approach aligns with Construction and Infrastructure Workforce Development Council's goals and the Education and Training Act 2020, which emphasize a low-emission, climate-resilient New Zealand, global sustainability, and future learner skills.

Collaborative capability exploration continues in Phase 2. **Table 2**'s purpose statements are abbreviated, with source links provided. Note the extensive related laws, policies, strategies, and initiatives within each document, familiar to professionals in their fields.

Table 2 Seven clusters of outcomes the Government seeks

Outcome focus area	Purpose
CLIMATE CHANGE	<p><b>Climate Change Response Act 2002<sup>12</sup></b> Section 3 Purpose (edited excerpts only)</p> <ul style="list-style-type: none"> <li>develop and implement clear and stable climate change policies that contribute to the global effort under the Paris Agreement to limit the global average temperature increase to 1.5° Celsius above pre-industrial levels; and allow NZ to prepare for, and adapt to, the effects of climate change</li> <li>enable NZ to meet its international obligations under the 1992 United Nations Framework Convention on Climate Change (UNFCCC), the 1997 Protocol to the UNFCCC and the 2015 Paris Agreement</li> <li>reduce the emission of greenhouse gases and assist New Zealand to meet its 2050 target and emissions budgets</li> </ul>
BIODIVERSITY Te mana o te taiao	<p><b>The Aotearoa New Zealand Biodiversity Strategy 2020<sup>13</sup></b> The strategy sets a strategic direction for the protection, restoration and sustainable use of biodiversity, particularly indigenous biodiversity, from 2020 to 2050 and supports Aotearoa New Zealand to meet its international obligations under the United Nations Convention on Biological Diversity. <b>The objective of the National Policy Statement for Indigenous Biodiversity<sup>14</sup></b> is to maintain indigenous biodiversity across Aotearoa New Zealand so that there is at least no overall loss in indigenous biodiversity after the commencement date.</p>
WATER Te mana o te wai	<p><b>The National Policy Statement on Freshwater Management 2020</b> (amended February 2023)<sup>15</sup> and the <b>Water Services Act 2021<sup>16</sup></b> Both of these refer to the hierarchy of obligations in Te Mana o te Wai that prioritises:</p> <ul style="list-style-type: none"> <li>first, the health and well-being of water bodies and freshwater ecosystems</li> <li>second, the health needs of people (such as drinking water)</li> <li>third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future.</li> </ul>
NATURAL AND BUILT ENVIRONMENTS Te oranga o te taiao	<p><b>Natural and Built Environments Bill 2020<sup>17</sup></b> (part of a series of bills in the ongoing reform of the Resource Management Act) Section 3 states that the purpose of the Act is to uphold te Oranga o te Taiao (the wellbeing of the natural environment) and that the purpose must be achieved in a way that protects the health of the natural environment; and subject to the previous clause, enables the use and development of the environment in a way that promotes the well-being of both present and future generations.</p>
WASTE MINIMISATION	<p><b>Waste Minimisation Act 2008<sup>18</sup></b> Section 3 states that the purpose of the Act is to encourage waste minimisation and a decrease in waste disposal in order to protect the environment from harm; and provide environmental, social, economic, and cultural benefits. Section 43 provides that territorial authorities must adopt a waste management and minimisation plan that includes objectives, policies and methods for achieving effective and efficient waste management and minimisation.</p>
INFRASTRUCTURE	<p><b>The New Zealand Infrastructure Strategy 2022-2052<sup>19</sup></b> The Strategy has five objectives to achieve a thriving New Zealand. These aim to provide national infrastructure that enables a net-zero carbon emissions Aotearoa, supports cities, towns and regions to flourish through better long-term planning, pricing and good public transport, strengthens resilience to shocks and stresses and moves New Zealand to a circular economy by setting a national direction for waste, managing pressure on landfills and waste-recovery infrastructure and developing a framework for the operation of waste-to-energy infrastructure.</p>



Table 3 Key words summarising the skills needs identified by project participants

Carbon and Energy Professionals	Civil Contractors New Zealand	WasteMINZ	Water New Zealand
<p>knowledge and understanding of how emissions come about and how to:</p> <ul style="list-style-type: none"> <li>quantify them;</li> <li>plan to reduce them; and</li> <li>set out the practical steps required to implement those plans;</li> </ul> <p>Renewable energy</p> <p>Energy efficiency</p> <p>Carbon accounting and reporting</p> <p>Energy efficiency and process engineering skills</p> <p>Career pathway planning</p> <p>Credible professional credentials consistent with ISO17024, the international standard;</p> <p>Ease of access to knowledge so that:</p> <ul style="list-style-type: none"> <li>larger organisations and the public sector can embed these skill sets</li> <li>medium and smaller organisations can readily access them</li> </ul> <p>Enhanced business understanding of the business value, competitive advantage and wider economic benefits of investing in decarbonisation</p>	<p>Te ao Māori, mātauranga Māori, treaty issues, te mana o te wai</p> <p>Resource management</p> <p>Climate change, whole of life emissions reduction, energy and fuel efficiency in manufacturing and vehicle fleets</p> <p>Water and materials efficiency</p> <p>Research, specifications for construction and demolition waste avoidance, reuse and recycling</p> <p>Supply chain sustainability, sustainable procurement and tendering</p> <p>Using ISO 14064 greenhouse gas accounting and verification to calculate embodied carbon in infrastructure</p> <p>Emissions reduction guidance for transport and water construction;</p> <p>Climate-resilient, green infrastructure</p> <p>Decarbonising heavy machinery and heavy vehicle fleets</p> <p>Workflow planning and workforce skills development</p> <p>How to tap into the knowledge of aging professionals before it is lost as they exit the workforce</p>	<p>Te Tiriti, te ao and mātauranga Māori and resourcing Māori participation</p> <p>Legislative framework for zero waste</p> <p>Circular economy and waste hierarchy</p> <p>Landfills; recycling; reuse and repair; organic materials; waste to energy; product stewardship; import / export / levy systems; properties of materials</p> <p>Construction and demolition waste</p> <p>Supply chain management and chain of custody for recovered materials</p> <p>Hazardous waste, contaminated soil</p> <p>Waste reduction for climate changing emissions across the economy</p> <p>Land use planning training on the Natural and Built Environment and Spatial Planning Acts</p> <p>Developing Waste Management and Minimisation Plans</p> <p>Efficient data collection, verification and storage of data</p> <p>Environmental reporting, ISO14001</p> <p>Waste infrastructure asset management</p> <p>Food waste reduction</p>	<p>Te mana o te wai, te ao Māori, mātauranga Māori, resourcing mana whenua to be active partners in co-governance, co-management, co-design and co-delivery of sustainable water services and outcomes</p> <p>Iwi workforce development</p> <p>On-site wastewater and stormwater systems training and qualifications</p> <p>Water-related building consent training</p> <p>Efficient trade waste management and compliance monitoring and reporting</p> <p>Training for laboratory staff, environmental experts and process engineers to comply with drinking requirements</p> <p>Land use planning training on the Natural and Built Environment and Spatial Planning Bills that gives effect to te mana o te wai</p> <p>PFAS and other emerging contaminants</p> <p>Guidelines, consenting, management frameworks, monitoring and reporting requirements for drinking water and wastewater</p>
Environmental Communications Ltd	<p>Current and intergenerational wellbeing; value and resourcing of industry associations to deliver training; the fundamental unit of land use planning and management of both natural and built environments must be the surface water catchment and its associated (and not always congruent) underground waters, together with their freshwater and coastal receiving environments; measuring and monetising outcomes across all four wellbeings; social, cultural, economic and environmental.</p>		

The above summary of skills needs, from all parties, show how carbon, water and waste flow throughout the entire economy. The effects of the associated environmental skills gaps will likewise flow throughout the economy, in the form of reduced productivity and the creation of more problems than we are able to solve.

### 4.3 Key alignments of skills and legislation

- “ ‘The four megatrends that pose a risk to critical infrastructure are climate change, national security risks, fragmented global economy, and rapid technological change.’<sup>20</sup>
- Water New Zealand acknowledges the risks these pose, and notes that ‘a missing trend is capability and capacity of the workforce to deliver – it has been recognised the water sector needs 5,849 to 9,260 staff – an~80% increase in the size of the water workforce over 30 years across multiple disciplines.’<sup>21</sup>
- Water New Zealand submission to Department of Prime Minister and Cabinet*

**Section 4.1** summarises the long list of legislative and policy changes in recent years. **Section 4.2** indicates from submission and other materials from each of the four project participants the key skills needed for the industry to deliver on these. In this section, I overview which specialist environmental skills are needed by which participant to deliver the Government’s targeted outcomes.

Heading off climate change and biodiversity collapse, promoting te mana o te wai and te oranga o te taiao, remedying our infrastructure and construction deficits, growing a thriving, diverse and skilled workforce and becoming a wellbeing economy are the main dimensions of sustainability which the Government’s recent reforms aim to deliver.

The depth and diversity of the specialist skills revealed in the submissions of the four industry associations’ submissions is staggering – but in effect, as I will discuss later, the Government is asking their already over-worked members to deliver urgently-needed work for which they are not adequately resourced.





The mix of core and common skills needs includes:

- Carbon and Energy Professionals: while some of the necessary skills will be vocational, the carbon and energy sector’s many expert professionals clearly also need to upskill to meet more demanding requirements with respect to climate change, and to offer these skills to meet the needs of the water, built environments, waste and infrastructure sectors to the uniformly high standard they need;
- Civil Contractors New Zealand: while many of the skills necessary to deliver on the Government’s high-level outcomes will be vocational, the civil construction sector is home to many expert professionals who will also need to upskill to meet more demanding requirements particularly for climate change, biodiversity (for example by erosion and sediment control on worksites), water and waste;
- WasteMINZ: although the core skills of WasteMINZ members are firmly in the waste minimisation space, they are also directly relevant to achieving Government outcomes for climate change, biodiversity (especially via contaminant management) and for the significant waste generated by the water, built environments and infrastructure sectors; and
- Water New Zealand: although the core skills of Water New Zealand members are firmly in the water space, they also share responsibilities for achieving Government outcomes for climate change, biodiversity (especially freshwater and coastal aquatic biodiversity), natural and built environments and for the significant waste generated by built water infrastructure.

**Table 3** summarises the depth and breadth of the skills summarised above in relation to the seven key outcomes from the Government’s environmental and infrastructure reforms. As with **Figure 2**, It shows that while they each have their own particular core skills, they all contribute, directly or indirectly, to all seven of the Government’s key outcome areas.

Put another way, every sector of the economy needs all of these skills to a greater or lesser degree. This opens the way for the specialists in these industry associations to develop their knowledge and to share it in appropriate ways with their colleagues in related associations.

Table 3 Depth and breadth: core and common skills for delivering outcomes

Outcome focus area	Industry association			
	CEP	CCNZ	WasteMINZ	Water NZ
CLIMATE CHANGE		↑	✓	↑
BIODIVERSITY	↑	↑	↑	✓
WATER	✓	✓	✓	
NATURAL AND BUILT ENVIRONMENTS	✓	✓	✓	✓
WASTE MINIMISATION	✓	✓		✓
INFRASTRUCTURE	✓		✓	✓

#### KEY



The main home of the experts whose work progresses the Government outcome in that row



An important component of experts' work for which they need those skills



An important beneficial outcome of experts' work, though not a direct focus

The representation in **Table 3** is both subjective and qualitative, but suggests two key things:

- looking across the biodiversity row: while stormwater and planning professionals work with terrestrial and aquatic biodiversity experts, biodiversity definitely needs better representation, especially given its extreme importance and vulnerability. The Government's just-released National Policy Statement on Indigenous Biodiversity may go some way towards creating a core home or contact point for it. This will be extremely important for cost-effective workforce planning (Gap 4); and
- looking across the built and natural environments row: planning and resource management professionals are similarly under-represented in my analysis thus far, despite having several industry associations of their own, including the New Zealand Planning Institute, the Resource Management Law Association and Local Government New Zealand. While there is not the overlap of skills, especially engineering skills, with the disciplines of the four industry associations participating in this project, they have a major role to play in delivering the outcomes of all seven Government outcome focus areas (Gap 5).

I address these suggestions in **Section 5**.

#### 4.4 Current and proposed training

Considering the above, it is not surprising to find that all four project participants have been investing significant effort in detailing their members' CPD needs for delivering on the Government's desired environmental and infrastructure outcomes. **Table 4** overviews their current training offers and their future training plans.

From information available, it appears that these capability needs assessments have not yet progressed to a public statement of how this vitally important work is to be funded (Gap 6).

Table 4 Training available and planned by project participants

Source: Websites cited in **Appendix A** and information from project participants

Available training	Training plans
<b>Carbon and Energy Professionals</b>	
<p>Current training (all online):</p> <ul style="list-style-type: none"> <li>• Energy Management for Facilities Managers</li> <li>• Energy auditor training</li> <li>• Preparing a Carbon Inventory</li> <li>• Identifying Carbon Reduction Opportunities</li> <li>• Carbon Auditor Training (Auditing GHG Inventories)</li> <li>• Continuous Commissioning Specialist</li> <li>• Commercial Building Energy Specialist (HVAC &amp; Controls)</li> <li>• Optimising Process Heat Systems Training</li> <li>• Advanced Industrial Energy Systems Optimisation</li> <li>• Business Case Workshop (Finance): how to present the financial benefits of a project</li> </ul>	<p>CEP is in the process of remodelling its training certification framework. Step 1 is to develop or revisit 25 training modules on core topics. CEP has published a request for proposal to invite trainers and industry experts to help develop the future training modules and assessments.</p>
<b>Civil Contractors New Zealand</b>	
<p>Civil Trade Certification is a nationally recognised accreditation programme for civil contractors. It combines a recognised trade qualification with certified hours of practical experience and leads to registration as a Certified Tradesperson. Current areas for civil trade certification are:</p> <p>Road Construction &amp; Maintenance</p> <ul style="list-style-type: none"> <li>• Earthworks</li> <li>• Road Construction</li> <li>• Road Maintenance</li> <li>• Non-Structural Concrete</li> <li>• Forestry Earthworks</li> </ul> <p>Pipeline Construction &amp; Maintenance</p> <ul style="list-style-type: none"> <li>• Trenched</li> <li>• Trenchless</li> <li>• Water</li> <li>• Wastewater &amp; Stormwater</li> </ul> <p>Road Surfacing</p> <ul style="list-style-type: none"> <li>• Bituminous Mixes</li> <li>• Chipseal</li> <li>• Slurry</li> <li>• Binder Manufacturing</li> <li>• Bituminous Mixing Operation</li> <li>• Bituminous Spraying Operation</li> <li>• Road Marking (Testing)</li> </ul>	<p>CCNZ is currently reviewing their members' university qualifications and professional training needs.</p> <p>Based on my own environmental training experience with civil (horizontal) construction firms, below are common training topics for professional and vocational site staff:</p> <ul style="list-style-type: none"> <li>• erosion and sediment control</li> <li>• pollution prevention and spill response of contaminants such as sewage, concrete, bitumen, emulsion, paint, hazardous substances and other substances</li> <li>• avoiding physical damage to water bodies;</li> <li>• biodiversity: minimising damage to flora and fauna</li> <li>• biosecurity: preventing the spread of plant or animal pests and diseases such as Kauri dieback and myrtle rust</li> <li>• identifying and minimising damage to cultural heritage sites</li> <li>• identifying, managing and disposing of contaminated soil and spoil</li> <li>• working on unstable land or in sensitive or remote areas</li> <li>• controlling dust, vibration and litter</li> </ul>

Available training	Training plans
<b>WasteMINZ</b>	
<p>WasteMINZ has not hitherto offered training, although its sector groups have been active in developing numerous fact sheets, position statements, technical guidelines and other informative resources.</p> <p>WasteMINZ regularly hosts webinars and workshops, designed to connect members and improve the overall knowledge across the sectors and promotes relevant external training to its members, such as ‘Train the Trainer’ workshops. As well as hosting speakers and exhibitors, its annual conference also runs relevant pre-conference workshops.</p>	<p>Summarised below are the needs noted in <b>Section 4.2:</b></p> <ul style="list-style-type: none"> <li>• Te Tiriti, mātauranga Māori and developing genuine relationships with mana whenua</li> <li>• Legislative framework for waste in Aotearoa</li> <li>• The role of local authorities in managing and minimising waste</li> <li>• Circular economy, waste hierarchy and community engagement/education</li> <li>• Current waste management practices in New Zealand for a variety of waste types and management methods</li> <li>• Management of contractual relationships</li> <li>• Measuring impact and forward planning</li> <li>• System Design</li> <li>• Health and safety, including hazardous waste:</li> <li>• Project Management</li> <li>• Technical capabilities</li> <li>• Work-based opportunities</li> <li>• Waste minimisation skills for office-based workers in councils, Ministry for the Environment, consultancies, research and management jobs in the community sector, and in recycling companies.</li> </ul>
<b>Water New Zealand</b>	
<p>In recent years, Water New Zealand has employed a Training Development Manager and has produced a competency framework<sup>22</sup> for use by the water industry, developed on a role-by-role basis. It also offers the following training courses accessed from the page at <a href="https://www.waternz.org.nz/training">https://www.waternz.org.nz/training</a> :</p> <ul style="list-style-type: none"> <li>• Cultural Significance and Importance of Wai Module: 4-6 hour online training over four weeks</li> <li>• Short online courses with Digital Badges</li> <li>• Stormwater 101</li> <li>• Drinking Water 101</li> <li>• Drinking Water 201</li> <li>• Small Water Supplies 101</li> <li>• Backflow 101</li> <li>• Wastewater 101</li> <li>• Sampling 101</li> </ul>	<p>Water New Zealand’s 2020 Water Workforce Development report<sup>23</sup> recognises (p14) the need to undertake a gap analysis of sector skills and capability to identify the required recruitment and training needs and to inform the development of targeted training programmes.</p> <p>Water New Zealand members volunteer their time to a wide range of special interest <u>groups</u>, which may be accessed from the menu on its <a href="#">homepage</a>. Collectively these address all three piped waters as well as groundwater, rivers, climate change and other key issues the water sector faces.</p> <p>Several of these groups are considering training needs. The <a href="#">Stormwater Group</a> (of which I am a long-time member) is committed to implementing the Stormwater Training and Sector Development Strategy, discussed in <b>Section 4.5</b>.</p>

#### 4.5 Other players in the skills space

As well as the training provided and planned by the project participants and tertiary education and training bodies (including the Māori Qualifications Services (MQS), many of the bodies listed in both columns of **Table 1** also deliver training. There is long-established training originating from Ministry of Works and Development days



and now run by environmental consultancy WSP's [Environmental Training Centre](#). There are doubtless more commercial providers of environmental training not known at the time of writing this report.

Also on the scene are the recently established Regional Skills Leadership Groups (RSLGs).<sup>24</sup> These 15 Groups are independent advisory groups that are supported by MBIE but are locally based and regionally led with a mandate to identify and support better ways to meet future skills and workforce needs in their regions, both now and in the future, and advise on actions to address these. MBIE describes them as:

‘part of a joined-up approach to labour market planning that will see our workforce, education and immigration systems working together to better meet the differing skills needs across the motu. They are a fundamental part of the drive to build productive, inclusive, sustainable and resilient regions.’

The RSLGs are part of the Reform of Vocational Education (RoVE) and will work closely with the Workforce Development Councils for each sector group. The RSLGs’ work is ‘complemented by other initiatives targeting population groups, sectors and regional economic development, including the Government’s Employment Strategy; Employment Action Plans; Industry Transformation Plans and Regional Economic Priorities’.

‘Working with their regional partners, RSLGs will help to achieve:

- ‘A more coordinated labour market view that takes account of Te Tiriti o Waitangi principles and equity for priority groups.
- ‘Current and future workforce needs for our regions and cities are accessible and understood.
- ‘Our education, welfare and immigration agencies are better connected through regional labour market planning and delivery, reflecting partnership, equity and Kaupapa Māori.
- ‘Regional education, training and upskilling is responsive to the needs of learners and employers at all stages.
- ‘Greater ease for businesses to employ New Zealanders with the skills required for current and future jobs.
- ‘All skills and labour market activities are connected and informed by the same data and evidence.

‘RSLGs develop Regional Workforce Plans, which set out regional aspirations, priorities, and actions for current and future workforce skills development in their regions.’

Several of these plans include skills for green transitions. Excerpts from two examples on the MBIE webpage are:

- Taitokerau: Workforce resilience and climate change - there is significant capacity to produce renewable energy in the region. Leaning into the green skill capacity and capability within Taitokerau will generate a range of social, economic and environmental outcomes leading to workforce resilience to climate change. Supporting a shift to renewable energy would reflect our region’s commitments to the Zero Carbon amendment to the Climate Change Response Act in 2019 and to the Taitokerau Climate Adaptation Strategy, adopted by local councils with support from tangata whenua representatives. The RSLG have begun exploring the opportunity of Renewable Energy Zones with regional stakeholders including Te Kahu o Taonui, Te Hiku Iwi Development Trust, North Power, MSD and Te Puni Kōkiri.
- Tamaki Makarau: Regional Deep Dive: Green Skills and Jobs for a Circular Economy Workforce. The effects of global climate change issues... has intensified the urgency to build climate-resiliency through upskilling of green skills and preparing the region’s workforce for the green transition. The RSLG has committed to working with industry... In the 2022 RWP, the RSLG set out the definition of green jobs as jobs that cannot be performed without extensive knowledge of green skills. Green skills are defined as skills that enable the environmental sustainability of economic activities. Green transition is the process of evolution towards a green economy to support the goals of the Paris Agreement to deliver net-zero emissions to limit climate change to 1.5 degrees. The RSLG noted the importance of prioritising key industries and sectors where green skills and green jobs must be developed in order to transition towards a net zero carbon economy. The RSLG is ... building a better understanding of the changes required for the workforce to respond to climate change, identifying the skills associated with these changes, preparing the workforce to adapt to these changes and attracting appropriately skilled workers to Auckland from outside the region.... Initial research has commenced on the cost of transitioning to a

low carbon economy, with further modelling in progress to better understand the baseline and trajectory of green, circular and regenerative jobs and skills needs in Tāmaki Makaurau.

This work seems to be in its early stages but will generate invaluable workforce information. It will need to be informed by the expert practitioners who belong to the associations participating and referred to in this project.



Co-ordination of industry associations' efforts with each other and related initiatives like the RSLGs could prevent gaps and overlaps in training outputs and make better use of scarce financial and human resources while delivering improved outcomes across sectors. The problem is that these already over-stretched industry bodies have little capacity to work together at the necessary scale. Any collaborative strategy must address this capacity deficit.

#### 4.6 Key themes emerging

From **Sections 3 and 4** so far and the underlined terms in **Section 4.2**, the following interrelated themes emerge:

- an holistic approach to environment and economy that embeds te ao Māori;
- water-sensitive land use and infrastructure planning;
- multi-partner collaborations;
- data management and reporting;
- visible and accessible training;
- a Just Transition to a low-emissions, skills-based and circular economy; and
- industry fatigue.

##### 4.6.1 An holistic approach to environment and economy that embeds te ao Māori

Several submissions raised the need for a holistic approach to environmental and infrastructure issues. This was most comprehensively stated by CEP, as paraphrased below from one of its submissions:

Capability and capacity are key to enabling New Zealand to transition to a low emissions economy while making a Just Transition for the workforce. This will require a comprehensive workforce capacity and capability building programme. Building a sustainability-conscious workforce is an essential policy priority. The significance of this workforce transition must not be understated.

It must cover all workers, in all disciplines, at all levels, across all industries.

The submissions of all four project participants referred to:

- the need for tools and skills to take greater action on climate change across every sector of the economy, including a need to develop an holistic understanding of infrastructure emissions as well as of whole-of-life emissions across the rest of the many diverse sectors across the economy; and
- the need to address Te Tiriti, te ao Māori, mātauranga Māori and te mana o te wai; for genuine relationships with mana whenua who are resourced to be active partners in the co-governance, co-management, co-design and co-delivery of water and waste services.

It sounds impossible to take a whole-of-economy approach to environmental workforce development. But as we've seen, carbon, water and waste are already threaded throughout the whole economy. Focusing on these via a small number of skills-focused industry associations makes the job doable.

##### 4.6.2 Water sensitive land use and infrastructure planning

All four project participants referred to the need for good resource management, land use and regional spatial planning to manage the environmental effects of land management practices. The need for infrastructure to be climate-resilient was also important, and for this as well as for managing the effects of land uses on all forms of water, water-sensitive, biodiversity-focused and catchment-based land use planning skills are essential.

#### 4.6.3 Multi-partner collaborations

In stepping up to meet their sectors' capability and capacity needs, industry associations are stepping up to meet their sectors' capability and capacity needs. Some are working together, some are talking with each other and some are keeping abreast of others' activities while taking their own course.

Many submissions referred to the need for many parties to work closely together. One Water New Zealand submission referred to central, regional and territorial government bodies, the tertiary sector, public health experts and member bodies including Water New Zealand, IANZ (International Accreditation New Zealand), Engineering New Zealand, the Association of Consulting Engineers (ACE New Zealand) and the Institute of Public Works Engineering Australasia (IPWEA, now Apōpō) to put in place the support necessary to grow sector skills. WasteMINZ has also emphasised the need for coordinated efforts across government and effective central and local government partnerships to address waste issues.

Sustainable procurement, tendering, contractual relationships and project management also depend on healthy partnerships and collaboration. However, effective collaboration takes time and sustained commitment. The need to resource this time is often overlooked in planning and budgeting for collaborative projects.<sup>25</sup> Given how crowded the professional training space is, this highlights a significant gap in strategies aiming to understand and streamline environmental CPD (Gap 7).

#### 4.6.4 Data management and reporting

The explosion of environmental data and ever-increasing sophistication of technology and real-time GIS-based tools and information requires equally sophisticated and integrated tools to collect, verify, store and access data relating to built assets, carbon, energy, water and waste. Project participants referred to the need for carbon accounting, verification and reporting; waste data management; environmental compliance, monitoring and reporting; and sustainable asset management.

CEP also referred to the need to capture data about the business value, competitive advantage and wider economic benefits of business investments in decarbonisation.

Collection of this kind of information will be increasingly required by the Government's Procurement Rules<sup>26</sup>, which say that when buying goods or services, Government clients will consider:

- strategies to avoid unnecessary consumption and manage demand;
- minimising environmental impacts of the goods/services over the whole-of-life of the contract;
- value for money over the whole-of-life, rather than just the initial cost;
- costs and benefits to society, environment and economy; and
- suppliers' socially responsible practices including compliance with legislative obligations to employees.

The Rules list the following sustainability issues:

- climate change
- ozone depletion
- optimising use of natural resources
- minimise use of hazardous substances
- waste minimisation
- job creation
- health and safety
- equality
- fair pay for suppliers' staff
- economic regeneration
- build sustainable markets
- legal compliance
- public image protection and enhancement

Three rules are relevant to training for the environmental and infrastructure workforce:

- **Rule 16, Broader Outcomes**, says (p33) that when purchasing goods, services or works, Government agencies procuring works **must** (Government emphasis) consider, and incorporate where appropriate, Broader Outcomes. It defines 'broader outcomes' as 'the secondary benefits that are generated by the way a good, service or works is produced or delivered. These outcomes can be social, environmental, cultural or economic benefits, and will deliver long term public value for New Zealand.' Rule 16 also says that 'Broader Outcomes require you to consider not only the whole-of-life cost of the procurement, but also the costs and benefits to society, the environment and the economy.'

- **Rule 18, Construction Skills and training**, says (p35) that agencies **must** include questions about the skills development and training practices of the supplier and their sub- contractors. The explanation for this is that a Government priority is ‘to grow the capability and capacity of the construction workforce. Government is committed to working with industry to deliver the right people, at the right time, with the right skills, to meet current and future needs in the construction sector ... Evaluating a supplier on their skills development practices gives an incentive to suppliers to invest in and increase their workforce by employing and training more apprentices. It can also encourage suppliers to create employment opportunities (or opportunities to upskill) for targeted groups such as Māori, Pasifika and women to increase the diversity of the construction industry. This also means that suppliers who do not invest in developing the workforce are not able to undercut those who do on price. When evaluating a supplier’s practices, you should look at what recruitment, retention, training and skills development they do in general. You should consider all levels and construction professions, including but not limited to apprenticeships and equivalent training. You should also look at what further recruitment, skills development and training suppliers would commit to doing over the course of the contract.’
- **Rule 20, Transitioning to a net-zero emissions economy and designing waste out of the system**, says (p37) that Government procuring agencies should ‘(1) support the procurement of low-emissions and low-waste goods, services and works; and (2) encourage innovation to significantly reduce emissions and waste impacts from goods and services.’

While some guidance is available for giving effect to Rules 16 and 20<sup>27</sup>, some consultants and contractors may struggle to comply with Rule 18’s requirements around training.

As at October 2021 these rules apply to Government projects worth \$9 million or more, but over time they will inevitably filter down to lower-priced jobs and out to the private sector.

Policy effectiveness (RMA section 32) monitoring was also noted in one submission. This will also become more important, in line with the recommendations of the Parliamentary Commissioner for the Environment in his report *Environmental reporting, research and investment: do we know if we’re making a difference?*<sup>28</sup> and the eventual shift of Government focus on legislation and policy to implementation and evaluation.

Pricing mechanisms for carbon and waste and environmental indicator sets like the Natural Capital Protocol, Global Reporting Index and other tools reveal a world-leading opportunity to monetise the outcomes on the government’s wellbeing economy across all four wellbeings; social, cultural, economic and environmental.

#### 4.6.5 Visible and accessible training

People wanting training relevant to environmental and infrastructure issues in New Zealand at present face multiple barriers to finding it. Based on my 30+ years of environmental training both operational and strategic, common barriers include difficulties in finding it; assessing its relevance specifically to their needs; and accessing time and money from over-stretched employers, both public and private, to undertake it.

In many cases, the training now required as a result of recent and ongoing reforms is simply not yet available or is only available overseas. For example Water New Zealand’s latest National Performance review<sup>29</sup> at the time of reporting, 290 staff from 28 employers were enrolled in CPD programmes from bodies including Engineering New Zealand, Water New Zealand, Apōpō (formerly IPWEA), Local Government New Zealand, the UK-based Institution of Civil Engineers, UK-based CIWEM and the Engineering Council of South Africa.

The diversity of training providers sheds some light on the difficulty of finding the right training. Moreover, even where local experts are available, the industry is so over-stretched that their employers lack the capacity to free them up to develop or adapt the training its practitioners need.

The situation is exacerbated by other issues, including:

- multiple audiences with diverse training needs on given topics including central/regional/territorial government; mana whenua/iwi/hapū, skilled professionals/skilled tradespeople; businesses and non-government agencies including trade unions;

- the sheer volume of recent legislative change, which means that skills-specific overviews of key changes and things to look out for may not yet have been distilled for ease of access;
- multiple training providers operating in the absence of a coordinating strategy;
- the crossovers between capability and capacity for workforce upskilling and recruitment;
- the demographic gap between new graduates from polytechs and universities entering the professions and the progressive loss of retirement-age baby-boomers;
- how to achieve consistency of recognition of training delivered by many different parties;
- evaluability of research and evidence-based best practice guidelines that define the performance benchmarks that training must meet;
- lack of a coordinated approach to monitoring and evaluation of training outcomes; and
- lack of funding and other resources to address the issues above.

The preceding sections have given a high-level overview of the new skills and knowledge required. But how and where can they be found?

Depending on their needs, people will search for the subjects they want in different places:

- people seeking educational qualifications as school leavers and in later stages of life will search the websites of providers including polytechnics and universities;
- professionals in the workforce will look for CPD training on the websites of:
  - their own professional association;
  - other related associations including those listed in **Table 1**;
  - councils that provide environmental training (for example erosion and sediment control training for professional and vocational workers is widely available across the motu, and other topics are slowly emerging or re-emerging); and
  - other training providers such as WSP's Environmental Training Centre - if they are aware of these.

Hence professions as varied as engineering, surveying, planning, architecture and more, will chase up the options under the second point above; while tradespeople will pursue those under the first point.

That said, many of these professions and trades do not yet have up-to-date training on their environmental aspects and impacts.

In particular, the visibility of training is obscured not only by a multiplicity of providers, but also by the common missteps by subject matter experts such as those who are essential to growing the professional skills of our local environmental workforce. A common error is to focus on the **delivery** of the training they want before they identify the content – yet it is the **content** that trainees search for online.

With the partial exception of Clearwater in Melbourne<sup>30</sup>, training providers worldwide almost invariably list their training options under delivery headings such as workshops, webinars, online courses, field trips and so on, or by date, or in lists or topics with no structure to follow.

As noted in Water New Zealand's stormwater training strategy<sup>31</sup>, this means someone seeking training must search for it via multiple clicks and repetitive scrolling through multiple webpages. This is no help to someone with a **topic-specific** personal or professional development need.

Combine that with multiple similar training offers by multiple other bodies, and the result is that training is not readily visible or accessible. For example:

- training offers are set out in long lists of bare headings in alphabetical order or in order of their chronological addition to the list:
  - ⇒ there's no structure to the training on offer;
  - ⇒ it's difficult for people to find the training they want;
  - ⇒ training is done to comply with CPD and annual professional certification needs rather than for reasons of personal and professional satisfaction and challenge;
- there is no synoptic overview of a given profession's disciplines as an integrated whole:
  - ⇒ lack of collegiality, communication, cross-fertilisation and innovation between the different specialisations within a discipline and across it as an integrated whole;

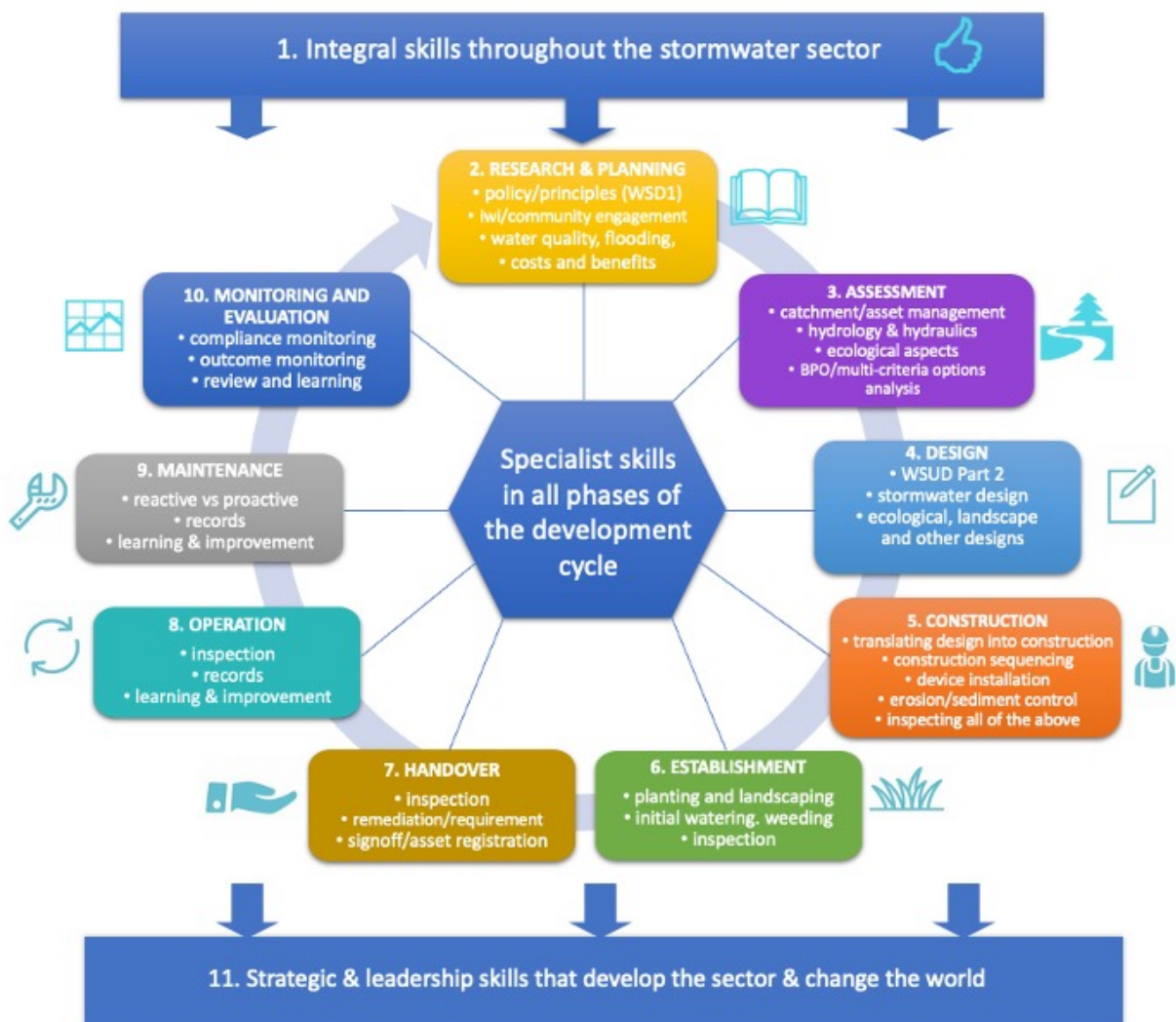
- ⇒ it's difficult to create a strategic overview of sector training needs that will develop individual professionals as well as the entire sector and its value to society;
- while training in the so-called 'soft skills' including leadership and the like is sometimes offered, there is no explicit and institutionally endorsed pathway to meet professional and sectoral (as opposed to technical) workforce development needs:
  - ⇒ there is no career development pathway within the profession; and
  - ⇒ missed opportunities to lift the profession overall and to open up career possibilities for environmental experts to move into wider sustainability leadership roles in society.

Professional environmental skills are so diverse, even within any one area of expertise, that a new way of mapping them is needed if we are to make them more visible and accessible. **Figure 6** is an example of this, taken from Water New Zealand's stormwater training strategy. <sup>ibid</sup>

Note that such work has not yet been done for , groundwater and other freshwaters or for coastal waters. Future training for drinking water and wastewater will be done by several agencies including Taumata Arowai and the new Water Services Entities.

Figure 3 Water sensitive stormwater skills as an example of a navigable skills map

Source Water New Zealand. 2021. *Water New Zealand Stormwater Training and Sector Development Strategy*<sup>32</sup>



**Figure 6** uses the water sensitive cycle as an organising concept to depict an environmental concept in a 1-page diagram that enables many specialised training topics to be organised in a readily graspable and integrated way.

The water sensitive cycle provides a conceptual framework to classify specialist stormwater-related training needs, because it applies equally to natural, greenfields and brownfields sites and describes a sequence of events and concurrent ongoing activities that need different skills. I call these diagrams holograms, and I accompany them with a detailed table of the training topics they contain.

Among the many advantages of the hologram is that it:

- focuses on skills, not job descriptions;
- readily supports the classification of training topics, grouping like with like topics within a coherent and logical framework;
- highlights which modules will be vitally important to a small number of people and others which will need to be addressed at a range of levels from overview/novice through to specialised/expert;
- seamlessly interweaves professional and vocational skills;
- enables specialised professionals to appreciate and transcend the silos they work in;
- aligns skill requirements with required legislative and policy outcomes;
- inspires people by showing them at a glance the bigger picture they are working in and towards;
- helps prioritise training by making it easier to identify where the most serious knock-on and compounding effects of lack of training occur, which helps to prioritise which topics to roll out first;
- highlights gaps in available training;
- and enables people with those skills to offer specialist training;
- enables integration of evaluation of the effectiveness of stormwater training with monitoring and evaluation of the effectiveness of stormwater management generally; and
- provides a simple structure to help people search for the training they want by purposefully navigating training topics with click-through to information and registration, thereby providing visibility and accessibility.

For the purposes of Phase 2, creating holograms of the core skills of each specialised industry association will make it easier to compare holograms from different disciplines so as to avoid duplication of effort and optimise use of scarce resources in developing training on interconnected topics.

It is easy to see how this approach supports the purposes of the Construction and Infrastructure Workforce Development Council and the Education and Training Act 2020<sup>33</sup>, which notes the need to consider (among other things) the transition to a low emissions and climate resilient Aotearoa New Zealand; new global challenges; global sustainability goals; and the skills, knowledge and qualifications learners need in future to achieve success for themselves and their communities.

**Appendix E** lists the skills alluded to in **Figure 3** within each of the water sensitive cycle stages, showing how they can be readily updated as new issues and opportunities come to light, with more topics and subtopics about to be added to the cycle itself as our understanding broadens and deepens.

The choice of training delivery method is then made to reflect the strategic and operational industry training needs across the water sensitive cycle and career progression and the specific technical needs and learning preferences of the various target audiences in those groups.



The skills of the environmental and infrastructure workforce need to be summarised in a way that enables clear planning, prioritisation and accessibility of the industry training needed to grow the capabilities required to deliver Government outcomes.

#### 4.6.6 A Just Transition to a low-emissions, skills-focused and circular economy

This report addresses the threats posed by environmental degradation and infrastructure deficits to the wellbeing of people, communities and the economy. The 'just transition' process aims to ensure that addressing these threats in the urgent timeframes needed also delivers social and economic as well as environmental benefits.

CEP considers capability and capacity to be one of five key aspects enabling New Zealand to transition to the low emissions economy envisaged by Government legislation, the others being effective carbon pricing; regulation; incentives and renewables. CEP says that ‘enabling New Zealand to transition to a low emissions economy will require investment in capacity and capability building of its workforce. As a nation, we require a comprehensive capacity building programme to ensure emissions and renewables targets are met and to do so in a Just manner.’

In 2016, the International Trade Union Confederation (ITUC) set up the world’s first Just Transition Centre in Brussels with partners from around the world. The Centre ‘brings together workers and their unions, communities, businesses and governments in social dialogue’ to secure the ‘future and livelihoods of workers and their communities in the transition to a low-carbon economy’. Training opportunities will help guarantee ‘decent jobs ... and greater job security for all workers affected by global warming and climate change policies’.<sup>34</sup>

Since 2017, New Zealand has its own Just Transition Unit, focused on the fossil fuels sector, but every sector of the economy needs a just transition for the job security of the people in its workforce and to make faster and more deliberate progress towards sustainability.

In 2018 the New Zealand Council of Trade Unions released a 10-point plan<sup>35</sup> to promote ‘decent work’ in a low carbon economy, and MBIE has just released a guide to just transitions for communities in Aotearoa New Zealand.<sup>36</sup> It targets actions at the local level, so does not address professional skills, but it includes an excellent set of nine *mātāpono*, or principles, which are included in **Appendix D** and will be very useful for industry associations, and for Phase 2 of this project.

Continuing professional development in the environmental and infrastructure sector is a vital part of a just transition to a low emissions, life-supporting, wellbeing economy for Aotearoa New Zealand.

The carbon and energy sector is the focus of most work around the world and in Aotearoa New Zealand on creating a just transition to a low emissions, net zero carbon economy. However, as Judge Tony Randerson<sup>3</sup> pointed out (in so many words), the transition from the RMA to the new planning legislation also needs a just transition, for government at all levels and for *iwi/hapū*, business and NGOs alike.

The water and waste sectors are saying the same with respect to the three waters and freshwater reforms and waste minimisation targets. Given the intertwining of those skills with those in the infrastructure sector, effectively we need a Just Transition for the entire environmental workforce, professional and vocational, to support a smooth and timely transition from the legislative settings of the past into those of a sustainable future (Gap 8).

As CEP points out, such a transition does not happen unaided. A recent report on future energy skills needs in the UK<sup>37</sup> noted (p2) that ‘the creation of two million jobs as the UK moves towards Net Zero, and the Opposition’s ambition for an accelerated journey to that same destination, are at serious risk due to skills constraints. A step change in the urgency and scale of government response is needed if we are to make the most of the potential of this moment.’

The report is focused on vocational skills, but many of the observations also apply to professional skills. **Table 6** lists some of the report’s findings, with my comments noted alongside each one.



Table 5 Skills and other needs for a Just Transition

Source The Future Energy Skills Programme. 2023. *The Skills for a Jobs Transition*. A July 2023 report downloadable from <https://futureenergyskills.co.uk/publications>.

UK Future Energy Skills findings	My comments
<p>Central government strategy (p31): government investment ‘must be accompanied by a clear government strategy to retrain and upskill workers in carbon-intensive sectors to ensure the ... industry has the skills it needs.’ NB: the report focuses on apprentice, not professional training.</p>	<p>I strongly endorse such an approach for Aotearoa New Zealand. We need a training strategy for the professionals mentioned throughout this report – with the vitally important proviso that such a strategy needs to be developed by those professionals themselves, with appropriate support.</p>
<p>Three key skills challenges were noted (p39): <b>shortages</b>: finding and keeping enough people, with the right skills across all disciplines; <b>gaps</b>: the challenge of training and upskilling the 80 percent of the 2030 workforce who are already in the workforce today; and <b>cannibalisation</b>: the risk of keeping people in the sector and in the country, a particular risk in a sector where many workers are already internationally mobile.</p>	<p>Our business and government bodies are experiencing the same three issues, which reflect the scarcity of people with the capabilities that the energy and other skill-intensive sectors need. We also face the same pipeline capacity issue (p40) that ‘one fifth of people currently working in the energy sector are set to retire by 2030 as the ‘baby boomer’ generation reaches pensionable age’.</p>
<p>Local government support (p12): ‘The green skills challenge needs every part of government to work together, and to work flat out. The UK cannot transition to a green economy and meet its net-zero targets without the contribution of local government. In addition to providing public investment, local councils and combined authorities have devolved powers to direct strategic local measures to promote green skills.’</p>	<p>Industry associations can potentially play an even greater role than local government because they are the home of the environmental experts who both have and need the skills for a just – and fast – transition. These associations are already developing a great deal of training, working at and beyond the limits of their capacity to do so. The value of NGOs has long been undervalued, and they need to be able to influence workforce planning and development much more than they have been able to in recent years.</p>
<p>A strategic body (p25): ‘There is a need for a new strategic body, bringing together employers, workers, education, and government at every level, to oversee a skills strategy [provide leadership] and to monitor skills needs ... creating a new relationship of mutual accountability between government and industry ... Jobs and skills plans ... could be shared with universities, colleges and others with a stake in meeting the skills challenge.</p>	<p>In Aotearoa New Zealand we already have several bodies with responsibilities such as described opposite, although development of professional skills remains overlooked. At this stage, a new strategic <u>body</u> would complicate the landscape. However, a collaborative strategic <u>process</u> as outlined opposite would be most beneficial.</p>
<p>Funding (pages 25 and 44-45): following on from the above, the report says that ‘For its part government needs to provide frameworks and, in many cases, subsidies in order to drive the transition.’ It notes the UK <u>apprenticeship</u> system needs (among other things) a:</p> <ul style="list-style-type: none"> <li>• properly <b>funded</b> system</li> <li>• more <b>flexible</b> system focused on industry opportunities</li> <li>• <b>faster</b> system to meet emerging skills needs.</li> </ul>	<p>In terms of <u>professional</u> training, adequate government funding would support industry associations to work with their members to develop, deliver and evaluate the outcomes of the training they know they need. Such industry leadership and practitioner input would also deliver this professional development with the necessary speed and flexibility.</p>

Other project participants mentioned the opportunities provided by the Government’s reforms to create:

- transformative change while operating 'business as usual' (Water New Zealand)
- the circular jobs of the future (WasteMINZ).

This introduces the circular economy, to which WasteMINZ refers in its submissions. It is shown in **Figure 4**.

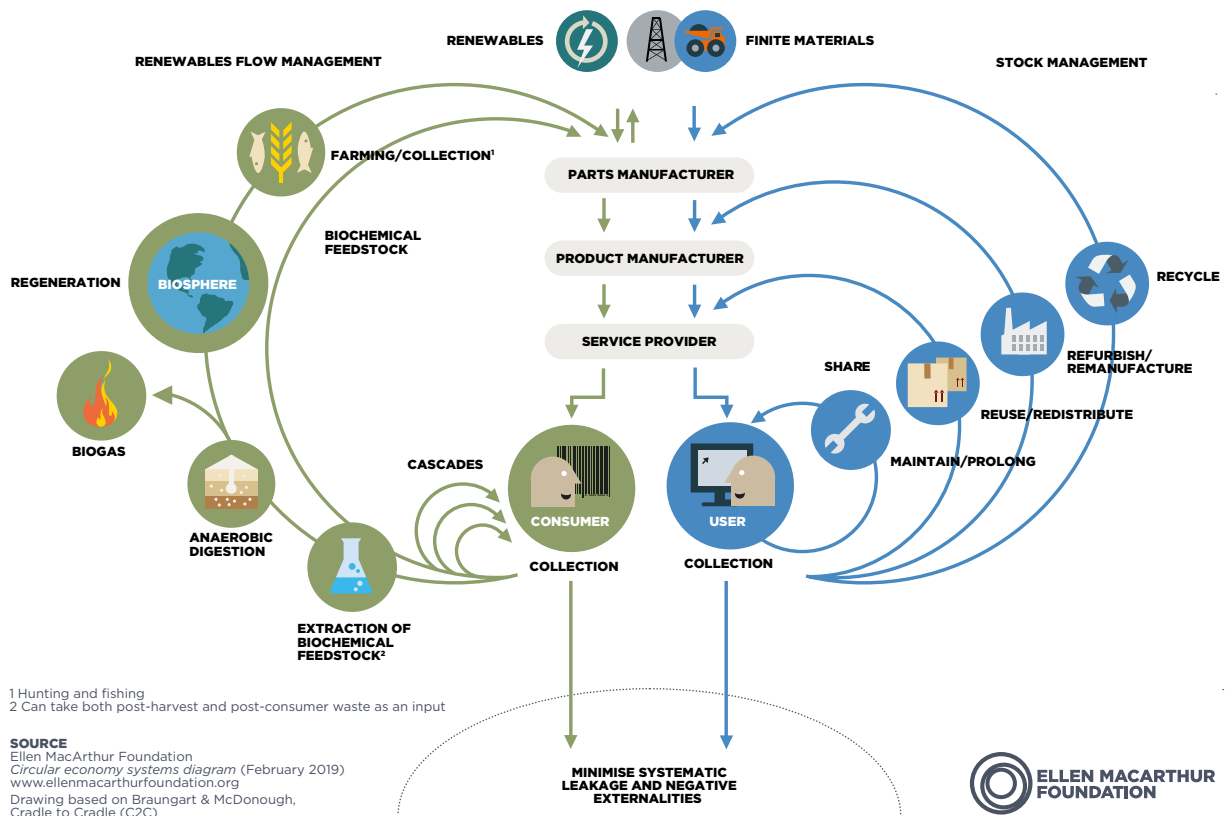
The Government’s 2022 Waste Strategy envisages getting rid of waste for a circular Aotearoa New Zealand<sup>38</sup>. The Territorial Authority Officers Forum of WasteMINZ envisages implementing the Strategy by working with other agencies to coordinate actions on the circular economy and climate change. A leading method for this is for local government to influence and embed circular design thinking within its projects (planning, design, procurement, delivery and operations) as a key initiative to reduce waste and greenhouse gas emissions. The forum notes that this will require additional resource and maturity in project management and procurement throughout territorial authorities, as there are different levels of resource and capability across councils.

The circular economy<sup>39</sup> separates natural from human-made materials in two complementary circles – the two wings of the butterfly diagram in **Figure 4**. It is a design-driven system where ‘materials never become waste and nature is regenerated. In a circular economy, products and materials are kept in circulation through processes like maintenance, reuse, refurbishment, remanufacture, recycling, and composting. The circular economy tackles climate change and other global challenges, like biodiversity loss, waste, and pollution, by decoupling economic activity from the consumption of finite resources.’ The circular economy is underpinned by a transition to renewable energy and materials and aims to eliminate waste and pollution; circulate products and materials at their highest value; and regenerate nature.

As with a low-emissions and wellbeing-focused economy, the circular economy is a resilient system that is good for business, people, and the environment.

Figure 4 Visualising the circular economy

Source Ellen MacArthur, from the page at <https://ellenmacarthurfoundation.org/circular-economy-diagram>



#### 4.6.7 The elephant under the carpet: industry fatigue

The summary above shows that project participants are inspired by the opportunities offered by a Just Transition to a low-emissions, circular, wellbeing economy. The elephant under the carpet? Industry fatigue.

Since 2017<sup>40</sup> (if not before) the infrastructure sector has grappled with skills shortages and a ballooning list of projects. As one participant acknowledged, 'there is so much going on in this space that everyone is tapped out ... You can regulate for anything you like, but regulation will not necessarily lead to increased ... compliance.'

The responses in **Sections 3 and 4** indicate that sustained capability and capacity gaps are taking a toll on industry associations and their members. My direct experience with the water sector is that while firms have the expertise and desire to develop in-house training for their staff, they are too busy on project work to do so. This industry fatigue could impact on the overall success of new projects and ability to give full effect to new legislative and policy requirements.

In essence, the professional skills we need require a high degree of specialised education and training across multiple disciplines, but the ability to grow capability is seriously constrained by lack of industry capacity.

Moreover, there are other professions also suffering capability and capacity constraints that have knock-on effects on the quality of the work done by the environmental and infrastructure workforce.

#### 4.7 Other skills deficits that impede industry effectiveness

Effective environmental management relies on robust science. However, two reports have drawn attention to capability and capacity shortages in the science sector which will hinder the work of policy-makers, mana whenua and practitioners alike.

A 2017 report<sup>41</sup> into science needs for conservation and the environment identified six themes, one of which had five subthemes. For nine of these eleven, significant capability and capacity deficits were identified that directly relate to the work of the four industry associations considered here:

- Theme 1, Environmental monitoring and data management: the report said that improved capability and capacity will be required in taxonomy, bioinformatics, data management, and analysis;
- Theme 2, Mātauranga Māori: the report said there is limited capability and/or capacity of people in some government and research organisations and communities to identify the opportunities arising from mātauranga Māori translation of science into policy and management approaches is limited, especially in marine, estuarine and freshwater environments, and more limited still is the development of complementary policy and management tools. More effort is needed to strengthen capability in these areas;
- Theme 3, Climate change: the report said that there is a need to build capability in model development, science translation, and policy and management tools;
- Theme 4, Biosecurity: the report said that skills in biosystematics, (comparative) risk analysis, and environmental impact assessment are inadequate;
- Theme 5, Integrated ecosystems and processes comprises five sub-themes: land, fresh water, coastal and marine, urban, and species and populations. The report said that integrated system modellers are necessary – people who can access and understand systems dynamics, and who can work with specialists to develop the interactive system models needed to work across domains. Researchers who are experienced in data interoperability techniques and developing new data standards are also required, as are people at the science/policy interface who have the skills to take into account all environmental domains, human interactions with those domains, and their inter-relationships:
  - Integrated ecosystems and processes – land: the report said that current capability and strategic needs include taxonomic capability, systems and databases, modelling and scenario analysis, capability in community engagement and collaboration processes, mātauranga Māori, and knowledge transfer and translation;
  - Integrated ecosystems and processes – fresh water: here the report identified gaps that related more to data and tools than to specific science skills;

- Integrated ecosystems and processes – coasts and oceans: here again, the report identified gaps that related more to data and tools than to specific science skills;
- Integrated ecosystems and processes – urban: the report said that there is a growing need for more capability across disciplinary and functional divides within councils and other agencies involved in urban planning – in particular, between engineering and freshwater quality and habitat. These divides also need to address Mātauranga Māori concerns and their research needs;
- Integrated ecosystems and processes – species and populations: the report said that there has been a decline in specialised taxonomic expertise and in funding support for collections, and investment and capabilities are fragmented across organisations (Royal Society of New Zealand, 2015). A strategic and more tailored approach to investment in this area is needed, and immediate investment needs to maintain critical taxonomic expertise and services should be addressed; and
- Theme 6: Social and economic factors: a key question posed was how to build social and cultural capital to manage the environment more effectively – that is, ‘how can the economic, social and cultural benefits we derive from ecosystems (‘ecosystem services’) and intergenerational benefits and costs to the environment be identified and built into decision-making?’ The report said that while human factors and economic dimensions are key factors in environment and conservation policy and management decisions, the capability in these areas is relatively weak. The number of researchers in New Zealand with experience and skills in socio-economic research on environmental issues is small compared to those with biophysical expertise. Given the policy-relevance and importance of such research, there is a need to attract and employ more researchers with relevant skills, and to find ways to build them into collaborative groups with enough critical mass so they can undertake and publish quality research.

These deficits of capability, capacity and strategy reflect the longstanding lack of government investment in science, research and workforce development, to which the Productivity Commissioner has drawn attention<sup>42</sup>.

A 2023 report<sup>43</sup> by the ISC Global Commission on Science Missions for Sustainability (the ISC) calls for a ‘new way of doing science.’ It calls for investment in a ‘big science approach’ which prioritises sustainability, as part of a bid to speed up progress towards the UN Sustainable Development Goals (SDGs). The ISC firmly believes that ‘by better integrating science with other perspectives, we can achieve what the 2030 Agenda set out to do: creating the conditions for a fairer and more sustainable world, while living within planetary boundaries’ (p7).

To do so, the ISC says our current scientific model must be supplemented and rebalanced. This ‘requires incentivizing collaboration and outcomes between scientists, and of scientists, with other stakeholders, especially civil society, on large-scale sustainability challenges. Furthermore, the current model should shift from intense competition and fragmented science, both in terms of disciplines and funding, to building collaborative science communities. This report describes and advocates for mission science for sustainability as an urgently needed new form of science for the SDGs.’

The ISC concludes that this sustainability-driven science mission is ‘solutions-focused, time-bound, substantial at scale, and ambitious in the intended impact’, emphasizing the need for ‘science to directly engage with society, policy-makers, civil society, funders, the private sector and other relevant stakeholders – with the aim to co-design and co-implement interventions leading to urgent action locally and globally’ (p8).

The emphasis in the three paragraphs above is mine.

#### 4.8 Summary: building the skills for a Just Transition

Throughout their submissions and other work, the four industry associations are all expressing concerns about industry capability to deliver on the Government’s desired outcomes.

In the next section I explore how the learnings from this project might inform an integrated and collaborative approach to the training and development of the environmental and infrastructure workforce. A more integrated and collaborative approach to the science that underpins the work of these professionals would further support the development of an integrated approach to environmental training.

## 5. D3 LEARNINGS FOR THE PHASE 2 ENVIRONMENTAL CAPABILITY PROJECT

This section draws together the information above so as to demonstrate due diligence in preparing the business case for the Phase 2 Environmental Competency Project, ensuring that it is robust and focused, with clear, relevant and readily-actioned deliverables.

### 5.1 The key finding of this report

As Dr Bryan Betty notes for the medical sector, ‘The shortage of GPs is a problem that has been brewing for some time. It reflects 20 years of neglect of strategic workforce planning.’<sup>44</sup>

The same applies to the environmental and infrastructure sectors. A sustained commitment to ongoing workforce development is needed to address this. Whose job is it?

The overarching finding of this report is:

Industry associations play a pivotal role in workforce planning for a sustainable future.  
They are a vital contributor to the skills development work being done by government agencies.

Previous sections show that the four small membership associations who took part in this project, and others like them, are already playing an active role in workforce skills development – but their role has not hitherto been fully recognised (Gap 2). As a result, their agility and effectiveness as nimble and skilled environmental change agents is significantly under-leveraged.

This section suggests how the change-leading role of these agile, responsive and proactive industry associations could be supported, enabling them to make a difference at the pace and scale now required.

This will inform Phase 2 of this work, which will build the business case for funding them to do so.

### 5.2 The choreography of training: industry associations and other movers in the skills space

Environmental science, technology and management tools are fast-moving, both proactively and in response to external drivers such as emerging issues and legislative change. This will continue to be the case. This means there will always be a need for continuing development of everyone in the environmental workforce.

At present there is a big gap in both professional and vocational workforce skills between what we have and what we need to deliver on government outcomes, and bridging these gaps will require a burst of effort.

Practitioner-driven industry associations can be more nimble in meeting their own urgent professional training needs than tertiary educators working with formal qualifications on the New Zealand Qualification Framework (NZQF). Their highly specialised training topics may never become university or vocational courses. However, when accessible to the tertiary sector, they will play a leading role in informing their future development.

Clearly defining the professional skills necessary to deliver Government legislative and policy outcomes will:

- in the short term, inform the prioritisation of CPD training needs and the development and delivery of the training to the existing professional workforce for urgent delivery; and
- in the medium and longer term, inform the relevant audiences of the:
  - vocational skills and qualifications necessary to accompany the identified professional skills
  - need for university qualifications that may subsequently be developed.

It’s more than static pieces in a jigsaw puzzle. There will always be a dynamic upskilling of the workforce with a mix of NZQF qualifications and off-Framework training, including for work visa holders; and planning for the skills and knowledge of future graduates by embedding new knowledge and skills into the relevant qualifications.

It’s an ongoing demographic dance with professional, vocational and university learners taking their turns on the floor, coming off it with formal qualifications, ISO-standard training or informal job-related training – and with the music always playing the continuing professional development tune to keep everyone taking to the dance floor periodically throughout their working life. Line dancers, square dancers, circle dancers, solo performers, flash mobs – we all hit the floor when our turn comes.

5.3 Scope and relevance of Phase 1 findings to Phase 2

Task 3.1 aims to focus the scope of the Phase 2 Environmental Capability Project to ensure it is comprehensive with respect to Government outcomes while remaining directly relevant and useful to the sector groups taking part, and to the environmental practitioners who will be its direct (but not its only) beneficiaries.

The checklist in **Table 7** below assures this by noting the following outputs of Phase 1 which will inform Phase 2.

Table 7 Scope and relevance of Phase 1 findings to Phase 2

Scope for Phase 2	Informed by Phase 1 findings
<b>Task 3.1</b>	
<u>Comprehensive</u> with respect to Government outcomes	The focus of submissions provided by project participants informed the scope of Government outcomes as noted in: Section 2: Legislation and policy of interest to project participants Figure 2: The focus and spread of legislative submissions Table 2: Seven clusters of outcomes the Government seeks Appendix B: List of submissions by project participants
Directly <u>relevant</u> and <u>useful</u> to the project participants and their members, the environmental practitioners who will be its direct beneficiaries	This report brings together diverse inputs from the participants and distils them into: Section 4.2: Key skills the legislation requires from project participants Table 2: Seven clusters of outcomes the Government seeks Table 3: Depth and breadth: core and common skills for delivering outcomes Table 4: Training available and planned by project participants Together these tables give a synoptic view of how their specialist and complementary roles are focused on the Government’s suite of environmental and infrastructure reforms. This simplification of a complex landscape will facilitate clearer dialogue amongst these participants and with other parties
Directly relevant and useful to <u>other beneficiaries</u>	Light is shed on the many other players in the field of environmental capability, and identifies two professions to be included in Phase 2; biodiversity and planning/resource management in addition to those involved with tertiary education. See: Figure 1: Nested groups of environmental and infrastructure skills stakeholders Table 1: Lists of environmental and infrastructure skills stakeholders Section 4: Industry capability to deliver government outcomes
<b>Task 3.2</b>	
Elicit input from project participants to ensure Phase 2 can meet their <u>capability needs</u>	Project participants’ capability needs have been defined as noted above in Section 4.2 and Table 4. These show that this work is still in progress. This leads to the following key learnings from Phase 1: <ul style="list-style-type: none"> <li>• Phase 2 can support the development of holograms like Figure 5 that map the specialist skills needed for each sector;</li> <li>• These can help the participants to prioritise the training they need to develop a business case for funding it, which is the output of Phase 2;</li> <li>• A further phase of work will be needed to present the business case to the appropriate funding bodies to obtain the funding, and the Phase 2 outputs need to contain the information necessary to make such applications.</li> </ul>

Before proceeding with identifying key research questions, methods and indicators for Phase 2, I revisit the gaps identified in previous sections.

## 5.4 Mind the gaps

Preceding sections have identified the following gaps in the big picture of environmental workforce skills:

- Gap 1: There is no overall continuing professional development (CPD) strategy to identify, develop and deliver the interrelated skills that environmental and infrastructure professionals know they need to deliver the Government's required outcomes. Such a strategy would also inform the development of the vocational skills that interweave with their own.
- Gap 2: Expert environmental practitioners belong to a suite of industry associations that are actively involved in training, but the significant contribution and future potential of these associations has been overlooked.
- Gap 3: My use of the terms 'skills' and 'capability' refers to environmental skills such as aquatic ecology, carbon accounting, greenhouse gas emissions reduction, te mana o te wai, contaminates sites, solid waste minimisation, water sensitive design and devices and so on. As far as I am aware, these professional environmental skills needs have not been comprehensively documented in terms of industry ability to deliver on Government outcomes.
- Gap 4: Looking across the biodiversity row in **Table 3**: while stormwater and planning professionals work with terrestrial and aquatic biodiversity experts, biodiversity must be represented. The Government's just-released National Policy Statement on Indigenous Biodiversity may go some way towards creating a core home or contact point for it. Such a contact point will be extremely important for cost-effective workforce planning.
- Gap 5: Looking across the built and natural environments row in **Table 3**: planning and resource management professionals are similarly under-represented in my analysis thus far, despite having several industry associations of their own, namely the New Zealand Planning Institute, the Resource Management Law Association and Local Government New Zealand. While there is not the overlap of skills, specially engineering skills, with the disciplines of the four industry associations participating in this project, they have a major role to play in delivering the outcomes of all seven Government outcome areas.
- Gap 6: A second elephant under the carpet (crouching right next to industry fatigue) is funding – or the lack of it. Just as every environmental and infrastructure strategy of the last five years (bar one, the RMA Reform Panel) has mentioned the shortage of the skills needed to implement it but failed to suggest how to address this, so do they all overlook the resourcing necessary to do this. From information available, it appears that the four industry associations' capability needs assessments in **Table 4** have not yet progressed to a public statement of how this vitally important work is to be funded.
- Gap 7: Effective collaboration takes time and sustained commitment. The need to resource this time is often overlooked in planning and budgeting for collaborative projects. Given how crowded the professional training space is, this is a significant gap in strategies aiming to understand and streamline environmental CPD.
- Gap 8: The intertwining of carbon, energy, planning, water, waste and infrastructure throughout the economy means that we need a Just Transition for the whole of the environmental workforce, professional and vocational, to support a smooth and timely transition from the legislative settings of the past into those of a sustainable future.

These gaps reflect the lack of an over-arching body responsible for professional workforce training. WasteMINZ's Territorial Authorities Officers Forum has referred to<sup>45</sup> the need for a delivery-focused department or taskforce within the Ministry for the Environment (p14). In **Table 6** I suggest that In Aotearoa New Zealand we already have a number of bodies with similar responsibilities and that at this stage, a new strategic body would complicate the landscape, but that a collaborative strategic process would be beneficial.

The gaps above will be flipped around to inform a set of research questions for Phase 2 to address. In particular need of testing is my assertion that industry associations are the cost-effective key to professional training, as they are the cornerstone of my approach, and hence of the Phase 2 business case for funding. I hint at their importance next before suggesting some research questions for Phase 2 participants to debate.

## 5.5 The untapped power of industry associations

It is clear that government bodies value the expertise housed in these industry associations and that they play a crucial role in giving it access to expert technical input as well as views on the implementation aspects of its proposals a voice to practitioners. However in the context of numerous – albeit much-needed – government initiatives, significant infrastructure and construction demands, worsening environmental conditions and an acknowledged shortage of industry capability and capacity, these associations are under-resourced.

The Government's many environmental and infrastructure initiatives together with the global and local skills shortage and our mostly low-wage/low skill/low productivity economy offer a once-in-a-generation opportunity to tackle these issues at once.

Working through the relevant industry associations allows this process to be led by the urgent training needs of the expert professionals in the workforce, some of which are tied to mandatory and time-bound undertakings – as for climate change, freshwater and biodiversity, for example.

Only these experts can fully define their needs.

This is especially the case with rapidly developing and urgently needed technical knowledge that cannot be readily introduced into formal processes such as the Qualifications Framework.

Since the 1990s, business and economic luminaries like Peter Senge, Michael Porter and Joseph Stiglitz have endorsed the financial, economic and broader benefits of workplace learning. However they make no comment on how industry could be supported to do this. Advocates of learning organisations and environmental innovation as a source of competitive advantage encourage firms to pick up these opportunities, assuming that individual firms will perceive the benefits. But this model of individual uptake has had very low market penetration. And with our current environmental crises, we haven't got time to leave this to market forces.

But governments can't fund or force multitudes of individual firms to do their own training. However, industry associations, made up of member organisations, make it possible to access the many via the few, offering the fastest and most cost-effective route to environmental best practice amongst their members.

Seed funding would unleash the untapped power of these sector associations to invest in helping their experts develop the training the rest of their sector urgently needs.

Set up with outcome evaluation in mind, this training will deliver measurable returns on government investment in the wellbeing outcomes of its policy and legislative reforms.

The orphan child becomes a visible gorilla.



Industry associations have the skills to know what skills to grow. Let's fund them to do it.

## 5.6 Key research questions for Phase 2

Task 3.3 was identify key research questions and aspects of capability (continuing professional development) of the existing environmental workforce that need to be addressed in the Phase 2 Project.

At the highest level, the key research questions are:

- How could working together help a group of related industry associations to identify the specialist skills they all need to deliver on interrelated environmental and infrastructure reforms, and organise common and specialist topics in a way that is more cost-effective than working separately? Realistically, how practicable and feasible is this?
- What could it look like if trainings were aligned with Government outcomes in a way that training outcomes could be aggregated for reporting against environmental and infrastructure targets?



## 5.6.1 How might we work together?

“ I think the most significant theme [from our research] is the importance of collaboration. And it's not just about talking about working with people; it's actually about getting on and doing the hard, risky stuff together. So the message has come through: we talked to ten companies and every single one has prospered because of the fact that they are able to work collaboratively with other organisations. And that's about making sure there's alignment on purpose, alignment on values, ensuring that the organisations have a common goal of where they want to get to.

*KPMG Global Head of Agribusiness Ian Proudfoot*<sup>46</sup>

Task 3.4 was to identify project methods that support the active and constructive engagement of core groups. Could the analysis of core and related skills in **Table 3** support collaborative approaches to industry training?

One project participant said, 'I agree with your around the overall long term coordinated strategy that needs to be accepted and adopted by the wider industry in regard to environmental practice. Particularly, I agree with your comments around membership organisations sharing resources. Certainly this is something I've been trying to do with Water New Zealand, Quarrying and VEENZ' (Vocational Engineering Education NZ).

Two recent reports have emphasised the benefits of collaboration.

A 2023 Motu review of climate emissions data included a stocktake of New Zealand's modelling capacity. It identified 84 climate change or climate change mitigation models comprising 13 multi-sector models, 23 land use and agricultural models, 25 energy models, and 23 transport models. The stocktake identified 'at least one model for each sector of the first Emissions Reduction Plan for Aotearoa – except for Building and Construction' and found that modelling capacity varied between sectors.'

The report found that collaboration on modelling between different government agencies:

- allows for greater coordination (for example of key assumptions)
- facilitates interdependencies between models through sharing of data and information
- avoids duplication
- helps build capacity within the modelling community through learning opportunities and peer review.<sup>47</sup>

The same benefits could be expected from supporting related industry associations to collaborate on the professional training they know they need if they are to deliver on the Government's desired outcomes.

A 2022 report<sup>48</sup> looked at businesses in the food and fibre sector and the actions they took to not only survive but to grow and prosper over three pandemic-impacted years. The report found that collaboration was the key factor enabling primary industry businesses to thrive during the pandemic. Collaboration amongst industry players, even competitors, produced 'some really positive learning curves: many companies discovered benefits through that forced collaboration' and were continuing those relationships.<sup>49</sup>

The authors say (p27): 'Transformation means doing things in radically different ways. It comes with a high cost and with a greater risk of failure. In the short term, it incentivises organisations to hold onto conventional practices for as long as possible. However ... we should be accelerating efforts to think beyond today's issues and seek to solve tomorrow's big challenges now, while times are good. We will have an arsenal of game-changers up our sleeves' ... [from] conversations on opportunities where combining scale might unlock wider benefits for all.'

The authors coined the term 'transformational collaboration', saying 'We collaborate well in a crisis – why can't we collaborate like this every day?'

I agree. The pandemic crisis may be waning, but the environmental crises are peaking. We have never needed to deploy scarce resources more urgently and effectively than right now.

In sum, collaboration is a good idea – and it takes time and isn't easy. I propose to take a collaborative approach to developing a collaborative methodology as the first step of Phase 2. We can learn from MBIE's *Guide to Just Transitions for Communities in Aotearoa*, and the expertise of lead author Dr Will Allen.<sup>50</sup>

### 5.6.2 How might we learn together?

A formal post hoc peer review of this work would be invaluable, when it's reported at a suitable stage.

In addition, and in the interests of active and wider learning from the start, I suggest that we call the Phase 2 participating organisations the Pilot Group and that we form a Learning Group that wraps around them, as shown in **Figure 5**.

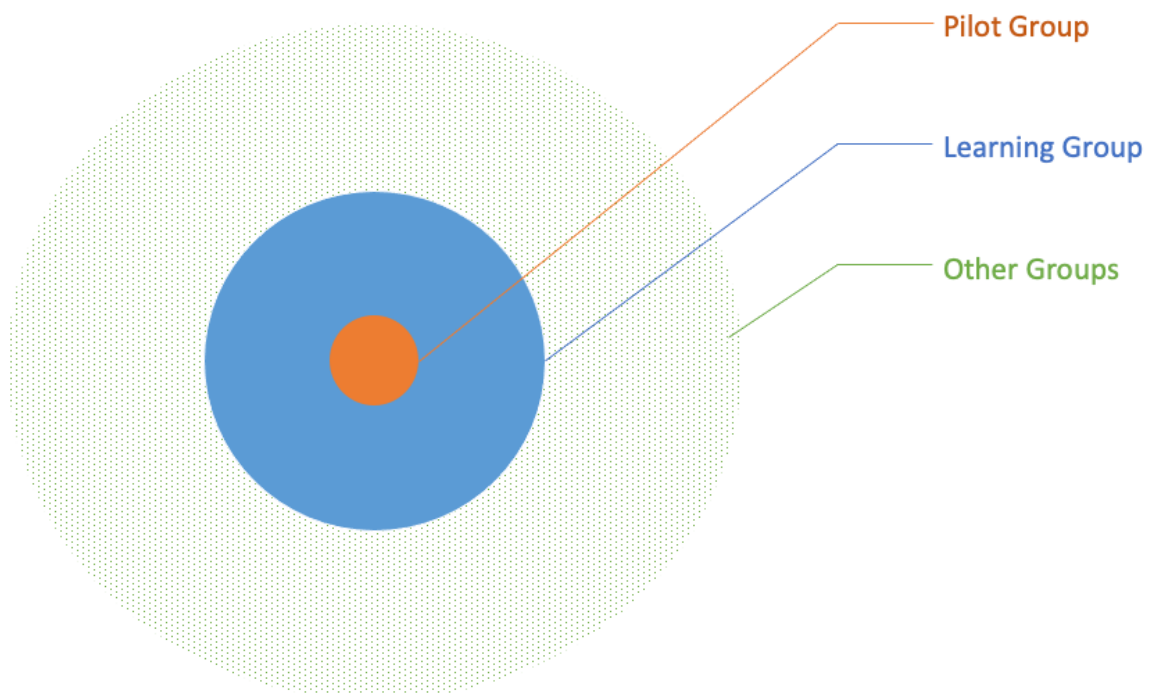
**Figure 5** shows the Learning Group surrounding the Pilot Group and also interfacing with another wider set of groups, similar to the nested stakeholders in **Figure 1**. The Learning Group has two roles:

- a more formal role combining the functions of peer review, editing, supporting, course corrections and more – a robust but friendly group who are committed to CPD of the environmental and infrastructure workforce; and
- a less formal role of simply talking about the work with others and bringing any suggestions to the Pilot Group.

Both functions would serve to socialise the work we are doing so that others can also collaborate with organisations in the Pilot and Learning groups and the groups of stakeholders in **Table 1**.

The Learning Group can be bigger than the Pilot Group and is essentially a coalition of the willing. One of the early steps in the next phase is to identify terms of engagement and terms of reference for them and to enlist suitable people. These would ideally include people who are supportive of the work as well as those whose opinions might be more challenging.

Figure 5 How a Learning Group can help the Pilot Group and other groups



In the long history of humankind (and animal kind, too) those who learned to collaborate and improvise most effectively have prevailed.

*Charles Darwin*

### 5.6.3 How might we align and measure training outcomes?

“ The government spends over \$2 billion each year on the environment. We need to know how we are affecting the environment, and whether the actions we are taking to improve it are working ... The scale and complexity of environmental challenges is not well handled by our current system of public accountability.

*Parliamentary Commissioner for the Environment (PCE)* <sup>51</sup>

The PCE's quote above directly relates to Task 3.5, which requires this report to inform the deliverables and short term outputs and outcomes during the project, as well as medium and long term indicators of outcomes post project completion.

In the full report on how do we know if we're making a difference for the environment, the PCE says (pp 50-51) that this requires:

- a clear statement of the state and trajectory of long-term environmental issues;
- a clear statement of the environmental outcomes that will endure across successive parliaments;
- a clear statement of the environmental outcomes the Government of the moment is specifically prioritising;
- a clear statement of how the Government intends to achieve those outcomes;
- a whole of government account of environmentally related spending that can be mapped to those outcomes;
- a whole of Government account of the key initiatives that contribute to those outcomes;
- environmental monitoring that tracks progress against those outcomes via specified measures;
- evaluation of the impact of those key initiatives on those outcomes;
- whole of government performance reporting that links key initiatives to those outcomes; and
- consistency in reporting.

The simplest way for this project to follow the PCE's recommendations is to build a logic model. There are many examples of logic models for tracking the effectiveness of management interventions in complex natural environments. **Figure 6** is a very basic model showing how assumptions about causality and the attribution and contribution of monitoring to interventions can be detected and tested.

Applying the PCE's logic to this environmental and infrastructure workforce CPD report:

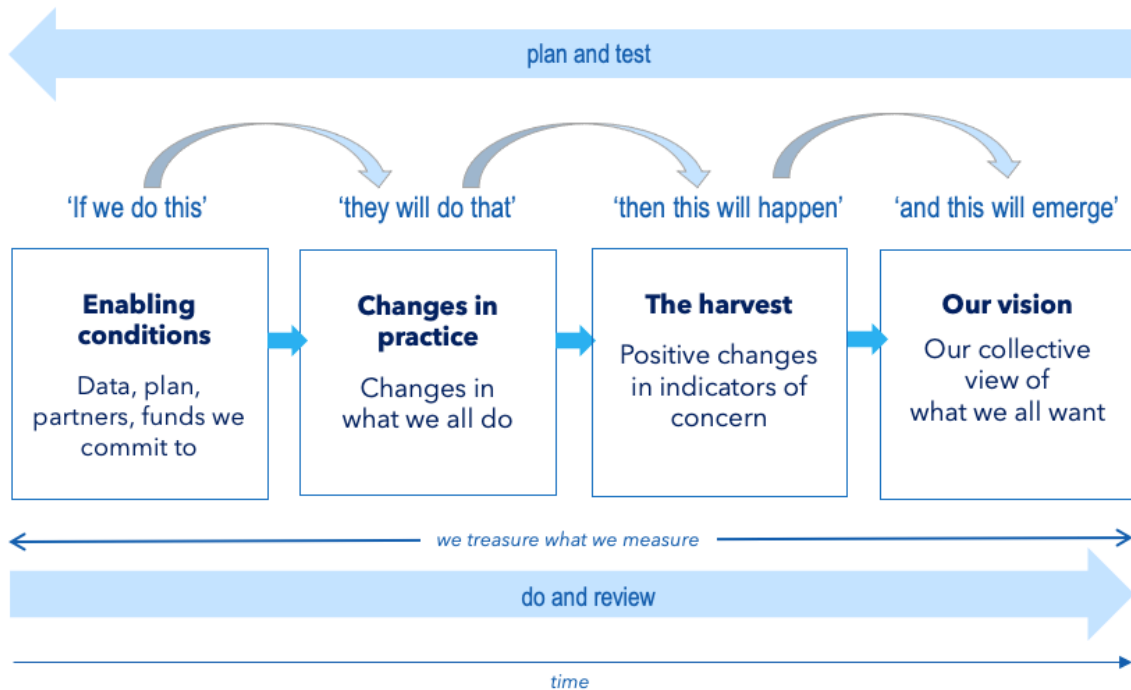
- the environmental issues and outcomes are specified (though not limited to) the Government initiatives listed in **Table 2** and elsewhere;
- how this report proposes to address them is by continuing professional development (although of course it is not the only tool in the environmental management toolbox);
- a logic model will help us map outcomes to training interventions;
- as we are dealing with carbon, energy, water, materials and waste flowing through the economy, we are effectively taking the whole-of-government approach to which project participants and the PCE refer;
- tracking and evaluating progress of how professional training helps to deliver the Government's desired outcomes is addressed below; and
- the collaborative approach proposed for Phase 2 will encourage consistent reporting.

As indicated earlier, this stage, project participants' skills analyses are not yet fully developed, so a full set of specific environmental outcome indicators is not yet available. However, **Table 8** is a logic model that lists, in general terms, the short term deliverables and outcomes from this Phase 1 project and anticipated medium and long term indicators of outcomes from Phase 2.

During Phase 2 and over time (recommending that we start small), project participants will be able to develop similar lists of outcome indicators across all four wellbeings – environmental, social, cultural and economic.

Figure 6 A simple logic model

Source Clare Feeney, adapted from UNEP/GPA *Ecosystem-based management: markers for assessing progress*<sup>52</sup>



The continuing professional development that is the focus of this report may or may not lead to formal qualifications or other recognition of training – but outcomes should nevertheless be tracked.

**Table 8** simply lists sets of outcome indicators that will inform the development of a monitoring and evaluation process to inform choices to be made in Phase 2, but **Figure 7** explains the first of the third order outcome indicators, to show how professional trainers evaluate the effectiveness of their training. The five levels of evaluation shown are supported by robust and globally recognised methods and indicators.

Although the five levels were specifically designed for evaluating training outcomes, Levels 4 and 5 can readily be adapted to accommodate environmental outcomes.

Figure 7 How professional trainers evaluate the effectiveness of their training

Source After Kirkpatrick and Phillips<sup>53</sup>



Table 8 An indicative logic model of Phase 1 and Phase 2 project outcomes

First order outcomes	Second order outcomes	Third order outcomes	Fourth order outcomes
<p>Enabling conditions needed to support an environmental and infrastructure CPD training programme ('inputs')</p>	<p>Observable changes in practice that will result (1) by project participants and (2) other parties. These are sometimes called 'outputs'.</p>	<p>Short, medium and long term indicators to measure the environmental, cultural, social and economic outcomes of CPD training</p>	<p>Vision and goals to inform the CPD training programme. These need not be measurable to begin with but may become so over time.</p>
<p>Phase 1 Landscape Scan and Phase 2 Business case preparation:</p> <ul style="list-style-type: none"> <li>• funding from ConCOVE</li> <li>• willing Pilot Project participants</li> <li>• willing Learning Group participants</li> <li>• specialist skills</li> <li>• training skills</li> <li>• collaborative skills</li> </ul> <p>Phase 3: delivery</p> <ul style="list-style-type: none"> <li>• funding from ConCOVE and/or other government bodies and possibly other agencies</li> <li>• willing project participants</li> <li>• specialist, training and collaborative skills</li> <li>• communication and engagement skills</li> </ul> <p>Reports on the above</p>	<p>Phase 1 participants:</p> <ul style="list-style-type: none"> <li>• share their experience and aspirations</li> <li>• communicate with each other</li> <li>• learn from each other</li> </ul> <p>Phase 2 Pilot Group participants:</p> <ul style="list-style-type: none"> <li>• share their expertise where useful and focus it where its experts need it</li> <li>• build holograms to map skills needs, and identify training priorities</li> <li>• set up training outcome evaluation frameworks, indicators, monitoring and evaluation</li> <li>• deliver and evaluate priority training</li> </ul> <p>Phase 2 Learning Group members:</p> <ul style="list-style-type: none"> <li>• observe, inform, support and improve the Pilot Group's process</li> <li>• disseminate learnings to their own and other organisations</li> </ul> <p>Phase 3 delivery:</p> <ul style="list-style-type: none"> <li>• seed funding-enabled priority CPD training is developed. Delivery gets under way based on sustainable fee-paying attendance</li> <li>• a collaborative training development, delivery, monitoring, evaluation and reporting system is set up</li> <li>• trainees apply learnings at work</li> <li>• tertiary educators make use of CPD training courses to inform qualifications on the NZQF</li> </ul>	<p>Select outcome indicators drawn from, for example:</p> <ul style="list-style-type: none"> <li>• the five levels of evaluation of the effectiveness of training (<b>Figure 7</b>)</li> <li>• indicators, outcomes and targets in relevant legislation and policy</li> <li>• Government Procurement Rules, especially Rules 16, 18 and 20<sup>54</sup></li> <li>• the four criteria used by Joseph Stiglitz and Lord Nicholas Stern to analyse the effectiveness of government stimuli in 50 countries to support their recovery from the 1980s global financial crisis<sup>55</sup></li> <li>• Treasury's Living Standards Framework, including its four future capitals and twelve wellbeing domains and the He Ara Waiora framework<sup>56</sup></li> <li>• GRI, or Global Reporting Index<sup>57</sup></li> <li>• World Economic Forum<sup>58</sup></li> <li>• Natural Capital Protocol<sup>59</sup></li> <li>• Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)<sup>60</sup></li> <li>• OECD Wellbeing Framework<sup>61</sup>, which New Zealand uses</li> <li>• United Nations Sustainable Development Goals<sup>62</sup>, to which New Zealand is a signatory</li> <li>• Stockholm Resilience Centre's planetary boundaries<sup>63</sup></li> </ul>	<p>To be defined by Phase 2 Participants.</p> <p>Below is an example that relates to my own vision.</p> <p>Aotearoa New Zealand is a Learning Society as advocated by Nobel Prize-winning economist and his colleague Bruce Greenwald<sup>64</sup>. I define a learning society as 'a society that supports the joyful journey of life-long and life-wide learning of every individual and every organisation. A true learning society can learn itself into achieving anything it wants.'</p> <p>Environmental workforce training transforms Aotearoa New Zealand's economy onto a low-emissions, high skills, circular, wellbeing-focused economy.</p>

#### 5.6.4 What other questions might we explore?

Task 3.6 was to note any other relevant considerations. I address these in the other research questions listed below, which reflect some of the methods used in this report and the identified gaps. These will need to be collaboratively scoped, aggregated and prioritised as part of the process of applying the findings of this report to the proposal for Phase 2 funding.

1. How well would the high-level summary of the Government's diverse environmental and infrastructure outcomes serve to inform an outcome monitoring framework? How might we need to make it fit for purpose?
2. What specialist environmental skills are needed by which groups, to deliver these outcomes?
3. Realistically, how well would the hologram method help to map the vast array of specialist skills that core industry associations require to deliver on Government outcomes? What else might cost-effectively help us to do this?
4. Who could help us find effective representation of biodiversity skills in this process?
5. Who could help us find effective representation of catchment planning, land use planning and resource management skills in this process?
6. What processes and relationships do we need to identify the accompanying vocational and educational needs?
7. How can we deliver these skills (capability) in the most timely and cost-effective way?
8. What monitoring and evaluation systems, platforms and support will we need?
9. What kind of Learning Management System or systems would work for a collaborative training venture as envisaged for Phase 2? How can we make our training visible and accessible to those who need or can offer training? What kind of provisional or permanent home might the LMS need?
10. What might an overall continuing professional development (CPD) strategy look like if it is to help us identify, develop and deliver the interrelated skills that environmental and infrastructure professionals know they need to deliver the Government's required outcomes?
11. What would it take to leverage the contribution of industry associations to deliver the professional CPD training their members so urgently need?
12. Who could help us estimate time commitments and agree on methods to help us to genuinely work as a collaborative, constructive and creative team?
13. How might our work inform a Just Transition for the whole of the environmental workforce, professional and vocational, to support a smooth and timely transition from the legislative settings of the past into those of a sustainable future?
14. What support will we need to identify appropriate funding sources for Phase 3 delivery?

This signals a move away from a more functional perspective towards a process approach across disciplines and across organisations. A process flow might more easily reveal interfaces, overlaps and lost potential synergies and capability needs. This proven methodology is the kind of holistic approach that the International Science Council recommends<sup>65</sup> for delivering better sustainability outcomes.

“ When tough times call, the first thing chopped in a budget is staff training ... It's always seen as a nice-to-have but we've got to get [a] long-term commitment to workforce training...’ Dr Ganesh Nana, Chair, New Zealand Productivity Commission<sup>66</sup>

## 6. NEXT STEPS

Before embarking on Phase 2 of this project, we need to disseminate and review this Phase 1 report. I suggest the following steps:

1. Send this Phase 1 report to participating organisations.
2. Present it in a 1-hour webinar to ConCOVE stakeholders.
3. Present it in a 1-hour webinar to the project participants.
4. Offer sufficient time for all parties to give free, full and frank feedback.
5. Update this report and prepare a circulation list to ConCOVE stakeholders, project participants and other interested parties.
6. Prepare a draft proposal for Phase 2 that reflects the key findings of this report, including suggesting who might be invited to join the Learning Group, terms of engagement and terms of reference.
7. Seek input from ConCOVE stakeholders, project participants and other recommended organisations
8. Update the proposal and submit it for Phase 2 funding.

I conclude with some comments about the funding that is the focus of the Phase 2 business case.

If we ask ourselves how we can deliver the skills (capability) we need in the most timely and cost-effective way, the short answer is: with money.

If the Government wants its environmental and infrastructure aspirations met in the time frames it has set, then it must invest in the capability of the existing expert professional workforce to step up to its new requirements.

That means we must build a business case for investing in CPD that is not only robust but is tailored to the sometimes unusual needs of the environmental and infrastructure workforce.

Much of the training that is needed may be able to be developed with some seed funding of the experts' preparation time, and can then go on to earn attendance fees that will cover the costs of the learning management system, marketing, delivery, monitoring, evaluation and updates.

However, as one project participant pointed out, some vitally important training may only be needed by a small numbers of learners. This is a barrier to full cost recovery. Because some roles are specialised, and Aotearoa is a small country, we can't always develop the training needed because we won't get enough trainees to recoup costs. A strategy and business case will help to identify courses that are necessary but may run at a long term loss which would benefit from a higher level of funding.

“ New Zealand's levels of investment have long lagged well behind those of the OECD average, including in research and development, infrastructure, skills and workforce development. Skill shortages are just one reflection of low investment efforts over the long term.

*Dr Ganesh Nana, Chair, Productivity Commission (pers comm)*

## DEFINITIONS AND ACRONYMS

CEP	Carbon and Energy Professionals	
CCNZ	Civil Contractors New Zealand	
DPMC	Department of Prime Minister and Cabinet	
ERP	Emissions Reduction Plan	
FENZ	Fire and Emergency New Zealand	
FTE	Full time equivalent staff	
Green jobs	Green jobs are a vital part of the ‘transformation of economies, enterprises, workplaces and labour markets into a sustainable, low-carbon economy providing decent work’. <sup>67</sup> The International Labour Organization (ILO) defines green jobs as decent jobs that: reduce consumption of energy and raw materials; limit greenhouse gas emissions; minimize waste and pollution; protect and restore ecosystems; and contribute to adapting to climate change.	
LGOIMA	Local Government Official Information and Meetings Act 1987	
NBEB	Natural and Built Environments Bill, one of the bills proposed to replace the Resource Management Act (see also SPB)	
MBIE	Ministry of Business, Innovation and Employment	
MfE	Ministry for the Environment	
NES	National Environmental Standard	
NPS	National Policy Statement	
PCE	Parliamentary Commissioner for the Environment (PCE)	
PFAS	PFAS (per- and poly-fluoroalkyl substances) is an acronym for a group of manufactured chemicals. They are resistant to water, oil, and heat. They have been used to make a range of products such as: <ul style="list-style-type: none"> <li>• household items</li> <li>• personal care products</li> <li>• cleaning products</li> <li>• industrial products including metal plating and firefighting foam<sup>68</sup></li> </ul>	
RFLG	Review into the Future for Local Government	
RMA	Resource Management Act	
RSLG	Regional Skills Leadership Group. There are 15 RSLGs, independent advisory groups that are supported by MBIE but are locally-based and regionally-led.	
SME	In training terms: subject matter expert In economic terms: small to medium sized enterprise	
SPB	Spatial Planning Bill, one of the bills proposed to replace the Resource Management Act (RMA). See also NBEB.	
Te Pūkenga	The New Zealand Institute of Skills and Technology, which comprises the nation-wide network of Institutes of Technology, Polytechnics and Industry Training Organisations who have come together into one organisation, Te Pūkenga.	
WSL	Water Services Legislation	
	EECP	Economic Efficiency and Consumer Protection Bill



## Appendix A Short descriptions of key industry associations

### Carbon and Energy Professionals (CEP)

<https://cep.org.nz/>

CEP is the professional body that represents energy efficiency and carbon professionals in New Zealand. It is a not-for-profit Incorporated Society and is affiliated with Engineering New Zealand as a Collaborating Technical Society. Supporting effective energy, carbon and sustainability management is embedded in CEP's constitution. The CEP membership comprises expert level practitioners in energy efficiency and carbon management, the people who will deliver carbon reductions across the New Zealand business environment.

CEP is the representative voice of its members, and supports them and its organisational partners to further the message of efficiency, productivity and decarbonisation. It runs training and accreditation programmes in carbon and energy management that develop the capacity of businesses to improve efficiency, productivity and reduce carbon emissions.

CEP is a collegial organisation whose members share their knowledge through technical sessions and other events designed to create a culture of cooperation, with the overarching objective of growing the sector.

Training pages are viewable here: <https://cep.org.nz/education/>

CEP's purpose is to address climate change through inspiring, educating and connecting professionals in energy, carbon and sustainability.

### Civil Contractors New Zealand (CCNZ)

<https://civilcontractors.co.nz/>

CCNZ is an incorporated society that represents the interests and aspirations of more than 700 member organisations, including large, medium-sized and small businesses in civil engineering, construction and general contracting, as well as those who provide products, support and services to them.

CCNZ members work for both the public and private sectors and play a vital role in the development of New Zealand, its economy and way of life. They build and maintain the roads connecting cities and towns. They install and care for the water networks that bring fresh water to houses and wastewater to treatment plants. They install the cables that bring the internet to homes and businesses. These are services a modern and developed economy must have to compete efficiently in world markets and to deliver high living standards for its people.

CCNZ work to support a healthy and safe industry, promote diversity, inclusion and fun and promote sustainability and environmental excellence.

Training pages are viewable here: <https://civiltrades.co.nz/>

Great people delivering quality infrastructure in a safe and sustainable industry.

### WasteMINZ

<https://www.wasteminz.org.nz/>

WasteMINZ is the leading professional body for the waste, resource recovery and contaminated land sectors in New Zealand. It has a diverse membership, from small industry operators, councils and environmental consultants through to large industry operators. It is an Incorporated Society and a non-for-profit organisation with over 1500 members.

WasteMINZ works towards ongoing and positive development of the industry through strengthening relationships, collaboration, knowledge sharing and championing the implementation of good practice standards.

WasteMINZ develops and strengthens relationships with key stakeholders and decision makers to ensure the industry is consulted when relevant projects, legislation or regulations are discussed. It has a strong relationship

with central government, especially the Ministry for the Environment, and with local government bodies across the country.

WasteMINZ holds an annual conference, networking events, collaborative workshops and informative webinars, and our sector groups provide good practice advice, guidelines, education and information for our members, to improve and advance the waste, resource recovery and contaminated land sectors across Aotearoa New Zealand

Information pages are viewable here: <https://www.wasteminz.org.nz/sector-groups> and here:

<https://www.wasteminz.org.nz/events>

Together building a more sustainable New Zealand.

#### Water New Zealand

Water <https://www.waternz.org.nz/>

Water New Zealand is the country's largest water industry body and provides leadership in the water sector through collaboration, professional development and networking. It is a not-for-profit organisation that represents water management professionals and organisations. It has around 3000 corporate and individual members drawn from all areas of the water management industry including regional councils and territorial authorities, Crown Research Institutes, consultants, suppliers, universities, government agencies and scientists.

Water New Zealand promotes the sustainable management and development of the water environment. This includes the promotion and support of best practice and management of the Three Waters – drinking, waste and stormwater. Water New Zealand advocates for the sustainability and health of our freshwater environment, and shares knowledge and brings expertise together to uphold the mana of water for Aotearoa New Zealand.

Training pages are viewable here: <https://www.waternz.org.nz/trainingcalendar>

Ka ora te wai, ka ora te whenua, ka ora ngā tāngata.  
if the water is healthy, the land is healthy, the people are healthy.

## Appendix B Lists of submissions by project participants

Below are listed the submissions and other comments from the core industry associations who took part in this project. They are listed in alphabetical order.

### B.1 Carbon and Energy Professionals

1. Climate-related Disclosures: Consultation on XRB Assurance. February 2023
2. Financial Sector Climate related Disclosures and Other Matters Amendment Bill, May 2021
3. GHG Emissions Disclosures Consultation: XRB Assurance Engagements, March 2023
4. GHG Emissions Disclosures: consultation on XRB Climate Related Disclosures NZCS1, May 2022
5. Process Heat: Phasing Out Fossil Fuels (Ministry for the Environment) May 2021
6. Process Heat in New Zealand, February 2019
7. Electricity Price Review Options Paper, March 2019
8. Carbon Zero Consultation Amendment Bill, July 2019
9. Climate Change Consultation: Building for October 2020
10. Climate Change: Briefing to Returning Minister, November 2020
11. Climate Change Commission Draft Advice, March 2021
12. Energy Efficient Products and Services Consultation, July 2021
13. Sustainable Biofuels Mandate, July 2021
14. Emissions Trading Scheme: ETS Governance, September 2021
15. Climate Related Disclosures XRB Consultation, November 2021
16. EV Chargers: EECA Consultation, September 2022
17. Renewable Energy and Energy Efficiency: Accelerating, February 2020
18. Climate Change Commission Draft Advice, July 2023
19. Energy and Resources: Briefing to Returning Minister, November 2020

### B.2 Civil Contractors New Zealand

1. Climate Change Response (Zero Carbon) Amendment Bill 07 Nov 2019
2. Construction Contracts (Retention Money) Amendment Bill 27 Aug 2021
3. Construction Sector Accord 15 Apr 2019
4. COVID-19 briefing paper
5. Draft National Adaptation Plan for climate change 09 Jun 2022
6. Education (Vocational Education and Training Reform) Bill 23 Oct 2019
7. Emissions Reduction Plan 11 Jul 2023
8. Government Procurement Rules (4th Edition) 10 Dec 2020
9. Government's Infrastructure Strategy 12 Sep 2022
10. Greenhouse Gas Emissions 08 Sep 2022
11. Guide to Temporary Traffic Management (NZGTTM 10 Mar 2022
12. Housing Acceleration Fund 24 March 2021
13. Immigration New Zealand Green List 12 Dec 2022
14. Immigration New Zealand's Skilled Migrant visa category 29 Nov 2022
15. Immigration Rebalance consultation 09 Jun 2022
16. Infrastructure Commission 21 Feb 2019
17. Infrastructure Commission/Te Waihanga Bill 29 May 2019
18. Infrastructure Funding and timing 01 Jul 2020
19. Infrastructure Funding New Zealand Upgrade Programme 29 Jan 2020
20. Infrastructure investment 11 Dec 2019
21. Infrastructure Pipeline 09 May 2019
22. Infrastructure Strategy for Aotearoa New Zealand 08 Jul 2021
23. Insolvency Law Review Working Group 06 Dec 2019

24. Land transport Government Policy Statement (GPS) 2021 17 Sep 2020
25. Land Transport National Programme 2021-2 07 Sep 2022
26. Land Transport Policy Statement 28 Jun 2018
27. Land Transport Policy Statement 30 Jul 2018
28. Managing our Wetlands discussion paper 28 Oct 2021
29. Modern slavery 09 Jun 2022
30. Natural and Built Environment (NBE) Bill 23 Feb 2023
31. Natural and Built Environments Bill (NBA) Exposure Draft 05 Aug 2021
32. New Zealand Infrastructure Strategy 2020 13 Oct 2021
33. NZS 3910:2013 Conditions of Contract for Building and Civil Engineering Construction 28 Oct 2021
34. NZS 3910:2013 Conditions of Contract for Building and Civil Engineering Construction 26 Nov 2020
35. Resource Management Act reform
36. Road User Charges 05 May 2022
37. Severe Weather Emergency Recovery Legislation Bill 30 Mar 2023
38. Shovel-ready infrastructure projects
39. Spatial Planning (SP) Bill 23 Feb 2023
40. Waihanganga Ara Rau Construction & Infrastructure Workforce Development Council Order in Council 21 Jan 2021
41. Water Services Economic Efficiency and Consumer Protection Bill 23 Feb 2023
42. Water Services Entities Bill 22 Jul 2022
43. Water Services Legislation Bill 23 Feb 2023
44. Water services review 20 Nov 2018

### B.3 Waste Management Institute of New Zealand

1. Basel Amendment
2. Building for Climate Change Framework
3. Carriage of plastic pellets by sea
4. Emissions Reduction Plans 1 and 2
5. Health & safety at work strategy
6. Improving the protection of drinking sources
7. Managing our wetlands: A discussion document on proposed changes to the wetland regulations
8. Minamata Convention: managing the trade in mercury and mercury products
9. National adaptation plan (climate change)
10. Natural and Built Environment Bill
11. NES Freshwater
12. NES outdoor storage of tyres
13. Phasing out hard-to-recycle and single-use plastics
14. Proposed national standards for outdoor storage of tyres
15. Proposed priority products & priority product stewardship scheme guidelines Proposed regulated product stewardship schemes and guidelines
16. Protection of drinking water
17. Regulation of f-gases
18. Regulations on product stewardship schemes for tyres and large batteries
19. Rethinking Plastics : Office of Prime Minister's Chief Science Advisor
20. Sector State of Play: Resource Recovery and Waste
21. Severe weather emergency recovery legislation
22. Taking responsibility for our waste: Te kawē i haepapa para
23. Transforming recycling
24. United Nations Treaty on Plastic Pollution
25. Waste disposal levy expansion

## B.4 Water New Zealand

1. Acceptable Solutions and Verification Methods 2016 Amendment 01/08/2016
2. Action for Healthy Waterways 22/10/2019
3. AS/NZS 1546.3: 2008 – Aerated Wastewater Treatment Units 01/02/2017
4. Better Urban Planning 01/10/2016 Productivity Commission
5. Better Urban Planning Issues Paper 01/03/2016
6. Building Code Update 2022: Plumbing and Drainage 05/07/2022
7. Building for Climate Change: transforming operational efficiency and reducing whole-of-life embodied carbon 22/09/2020
8. Building Performance Standards Review 01/02/2017
9. Building System Legislative Reform Programme 19/06/2019
10. Clean Water Consultation 01/04/2017
11. Climate Change Targets 01/04/2015
12. Climate Commission Report 17/03/2021
13. COVID-19 Recovery (Fast-Track Consenting) Bill 22/06/2020
14. Dam Safety Proposed Regulatory Framework 0/07/2019
15. Drinking Water Network Environmental Performance 31/03/2022
16. Drinking Water Quality Assurance Rules 31/03/2022
17. Economic Regulation and Consumer Protection 20 December 2021
18. Emissions Reduction Plan 22/12/2021
19. Emissions Reduction Plan second ERP 11/05/2023
20. Emissions Trading Scheme Review 01/12/2015
21. Environmental Reporting Discussion Document 01/08/2011
22. Fire and Emergency NZ (FENZ) Bill 01/08/2016
23. Fire and Emergency NZ (FENZ) Bill Proposed Regulations 01/08/2016
24. Freight and Supply Chain Strategy Discussion Paper 05/07/2022
25. Havelock North Water Supply Contamination Incident Draft TOR for the Government Inquiry 01/08/2016
26. Health (Fluoridation of Drinking Water) Amendment Bill submission 01/01/2017
27. Health and Safety at Work (Hazardous Substances) Regulations 2016 01/02/2016
28. Health and Safety at Work (Hazardous Substances) Regulations 2017 (Minor Amendments) 15/01/2020
29. Infrastructure Strategy Consultation 02/07/2021
30. Landfill Levy Expansion Consultation 2020 30/01/2020
31. LINZ Proposed Metadata Standards for Three Waters 01/08/2016
32. Local Government Act 2002 Amendment Bill (No 2) 01/07/2016
33. Local Government Act 2002 Amendment Bill (No 3) 01/02/2014
34. Local Government Act 2002 Amendment Bill 01/06/2010
35. Local Government Funding and Finance Review 30/07/2019
36. Local Government Funding And Financing Inquiry 11/02/2019 Productivity Commission
37. Local Government Funding Discussion Paper 01/03/2015
38. Local Government Official Information Meetings Amendment Bill 19/01/2023
- 39. Low Emissions Economy 15/05/2018 Productivity Commission**
40. Management and Removal of Asbestos Draft Code of Practice 01/05/2016
41. Marine and Coastal Area (Takutai Moana) Bill 01/03/2011
42. Microbeads Consultation 01/02/2017
43. National Adaptation Plan 07/06/2022
44. National Direction for Plantation and Exotic Carbon Afforestation 01/11/2022
45. National Disaster Resilience Strategy 05/12/2018
46. National Environmental Standard – Plantation Forestry 16/08/2022
47. National Environmental Standards for Sources of Human Drinking Water (NES-DW) 08/03/2022
48. National Planning Standards 01/08/2017
49. National Policy Statement for Freshwater 01/01/2009
50. National Policy Statement for Freshwater Management 01/01/2014
51. National Policy Statement for Indigenous Biodiversity 21/07/2022
52. National Policy Statement Freshwater Management 16/08/2022
53. National Policy Statement on Urban Development Capacity/07/2016

54. Natural and Built Environment Bill 19/01/2023
55. Natural and Built Environments Bill Exposure Draft 04/08/2021
56. Network Environmental Performance Measures Phase 2 12/12/2022
57. New Independent Infrastructure Body 25/10/2018
58. Occupational Regulatory Regime for Engineers 02/07/2021
59. PFAS National Environmental Management Plan 16/02/2023
60. Preventing harm from hydrogen sulphide 20/07/2021
61. Qualifications and other credentials simplifying 16/06/2021
62. Regulations Under the Medicines Act 1981 Proposed Amendment 01/01/2015
63. Resource Management Act Materials Discussion 03/03/2022
64. Resource Management Amendment Bill 07/11/2019
65. Resource Management Issues and Options Paper 03/02/2020
66. Resource Management Legislation Amendment Bill 2016 01/03/2016
67. Review into the Future for Local Government Draft Report 16/02/2023
68. Review of Educational Reform submission 04/04/2019
69. Spatial Planning Bill 19/01/2023
70. Standards and Accreditation Bill 01/01/2015
71. Taking responsibility for our waste 20/12/2021
72. Taumata Arowai - The Water Services Regulator Bill 04/03/2020
73. Technological Change and the Future of Work Inquiry 05/06/2019 Productivity Commission
74. Technology Change and the Future of Work 28/01/2020 Productivity Commission
75. Three Waters Economic Regulation 09/12/2021
76. Three Waters Economic Regulation 20/12/2021
77. Three Waters Reform 24/10/2018
78. Topics for Environmental Reporting: Freshwater Pressures from Management and Resource Use 01/12/2015
79. Urban Development Authorities Proposal 01/04/2017
80. Urban Development Bill 12/02/2020
81. Using Land for Housing 01/08/2015
82. Using Land for Housing Issues Paper Proposed Amendment 01/12/2014
83. Water Services Bill regulations 23/08/2021
84. Water Services Economic Efficiency and Consumer Protection Bill 09/02/2023
85. Water Services Entities Act 2022 16/06/2023
86. Water Services Entities Amendment Bill 27/06/2023
87. Water Services Entities Bill 16/08/2022
88. Water Services Legislation Bill 12/07/2023
89. Water Services Legislation Bill 17/02/2023
90. Water Services Regulator Bill 02/03/2021

## Appendix C Terms and website used to build the Word Cloud in Figure 2

The word cloud in Figure 2 was built on the website <https://wordart.com/>. I selected key words from all the submissions but found that separate words such as 'three waters', 'emissions trading', 'local government' and the like were treated as separate entries, even when joined by hyphens. I therefore reduced the terms to describe each law or policy in one core word, or two core words joined into one word. While this obscures the technical subtleties, it highlights the core areas of focus.

3Waters	COVID19	Immigration
3Waters	COVID19	Immigration
3Waters	DamSafety	Immigration
3Waters	Disaster-Resilience	Infrastructure
3Waters	DrinkingWater	Infrastructure
3Waters	DrinkingWater	Infrastructure
3Waters	DrinkingWater	Infrastructure
3Waters	DrinkingWater	Infrastructure
3Waters	DrinkingWater	Infrastructure
3Waters	DrinkingWater	Infrastructure
3Waters	DrinkingWater	Infrastructure
3Waters	DrinkingWater	Infrastructure
3Waters	Electricity	Infrastructure
3Waters	Emissions	Infrastructure
AcceptableSolution	Emissions	Infrastructure
Accreditation	Emissions	Infrastructure
Asbestos	Emissions	Insolvency
ASNZS1546	Emissions	Landfill
BaselAmendment	Emissions	LocalGovernment
Batteries	Energy	LocalGovernment
Biodiversity	Energy	LocalGovernment
Biofuels	Energy	LocalGovernment
Building	Energy	LocalGovernment
Building	Engineers	LocalGovernment
Building	EnvironmentalPerformance	LocalGovernment
BuiltEnvironments	EnvironmentalReporting	LocalGovernment
BuiltEnvironments	EVchargers	LowEmissionsEconomy
BuiltEnvironments	FENZ	Marine
BuiltEnvironments	FENZ	Medicines
BuiltEnvironments	fgases	Microbeads
BuiltEnvironments	FinancialSector	Minamata
CarbonAfforestation	FossilFuels	NaturalEnvironments
CleanWater	Freshwater	NaturalEnvironments
ClimateChange	Freshwater	NaturalEnvironments
ClimateChange	Freshwater	NaturalEnvironments
ClimateChange	Freshwater	NaturalEnvironments
ClimateChange	Freshwater	NaturalEnvironments
ClimateChange	Freshwater	NaturalEnvironments
ClimateChange	Freshwater	NZS3910
ClimateChange	Freshwater	NZS3910
ClimateChange	GreenhouseGases	PFAS
ClimateChange	GreenhouseGases	Planning-Standards
ClimateChange	GreenhouseGases	PlantationForestry
ClimateChange	HazardousSubstances	PlantationForestry
ClimateChange	HazardousSubstances	Plastics
ClimateChange	Health	Plastics
ClimateDisclosures	Health	Plastics
ClimateDisclosures	HealthyWaterways	Plastics
ClimateDisclosures	Housing	ProcessHeat
Coastal	Housing	ProcessHeat
ConstructionContracts	Housing	ProcurementRules
ConsumerProtection	Hydrogen-sulphide	Product-Stewardship

ProductStewardship	Standards	UrbanPlanning
Qualifications	Supply-Chain	VocationalEducation
Recycling	TaumataArowai	VocationalEducation
ResourceManagement	TechnologicalChange	WaihangaAraRau
ResourceManagement	TechnologicalChange	Waste
ResourceManagement	Traffic-Management	Waste
ResourceManagement	Transport	Waste
ResourceManagement	Transport	Waste
ResourceRecovery	Transport	XRB
Roading	Transport	XRB
Safety	Tyres	XRB
SectorAccord	Tyres	XRB
SevereWeather	Tyres	ZeroCarbon
SevereWeather	UrbanDevelopment	ZeroCarbon
Slavery	UrbanDevelopment	
SpatialPlanning	UrbanDevelopment	
SpatialPlanning	UrbanPlanning	



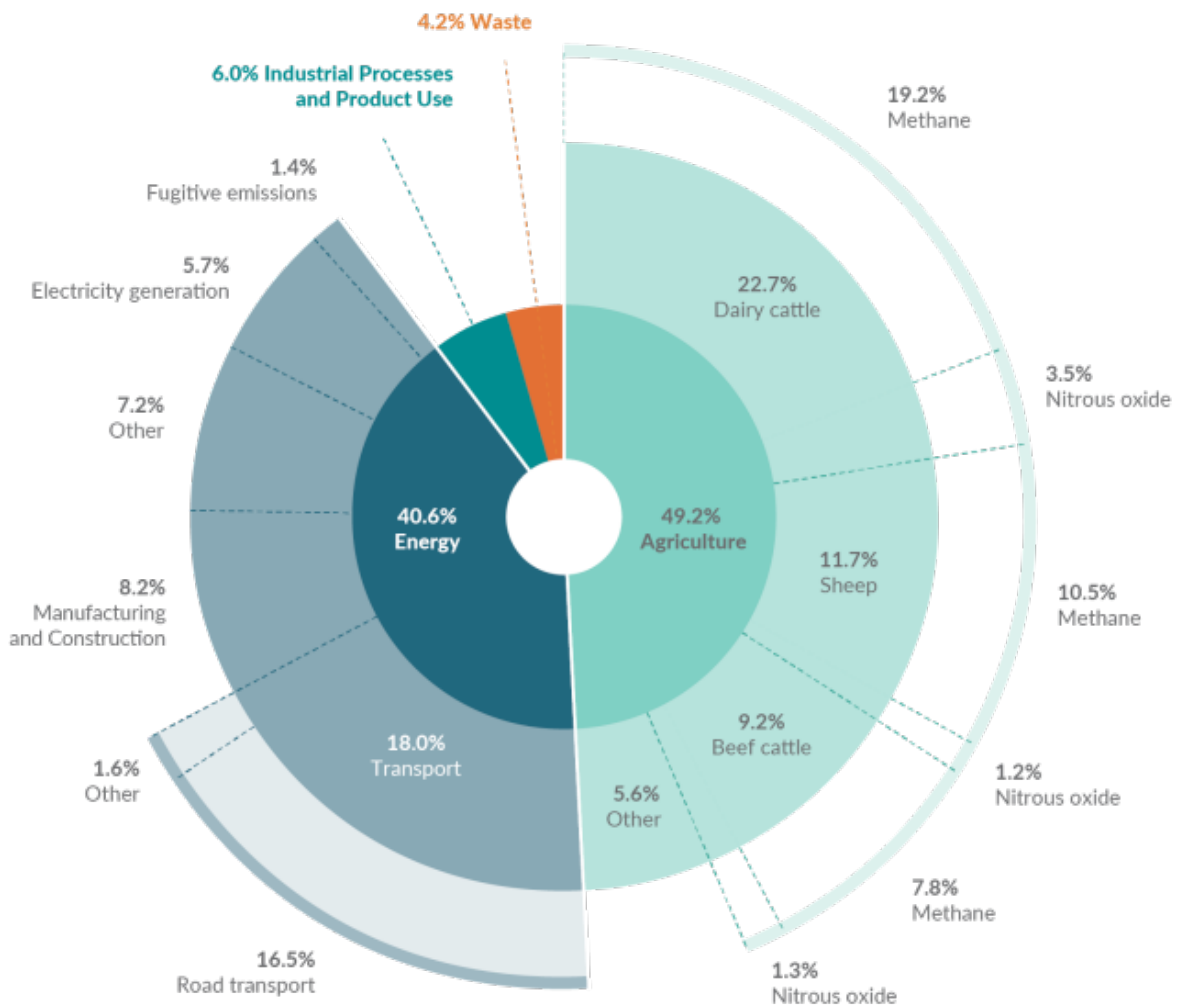
Appendix D Key skills the legislation requires from project participants

**Appendix D** lists in detail the skills that each industry association’s submissions identifies as necessary to give effect to the Government’s legislation, expanding on the list in **Table 3** of the words underlined below.

D.1 Carbon and Energy Professionals

**Figure 8** maps at a high level the sources of the country’s greenhouse gas emissions, but only hints at the staggering number of sources listed over nine pages of tables in a 2023 Ministry for the Environment report:<sup>69</sup> every activity from hospitals to sawmills, cafes to shopping malls, server farms to dairy farms, has its own specific skill requirements.

Figure 8 New Zealand gross greenhouse gas emissions in 2021 by sector, sub-category and gas type  
 Source: Ministry for the Environment. 2023. *New Zealand's Greenhouse Gas Inventory 1990–2021 Snapshot*.



Below is a high-level categorisation of the carbon and energy skills that are needed across the whole-of-economy image in **Figure 8**:

- knowledge and understanding of how to:
  - understand how emissions come about;
  - quantify them;
  - plan to reduce them; and
  - set out the practical steps required to implement those plans;

- training on programmes in renewable energy, energy efficiency and carbon reduction specifically adapted to all the many diverse sectors of the economy;
- carbon accounting and reporting;
- technical energy efficiency engineering skills to assess and improve processes;
- career pathway planning that provides credible professional credentials;
- skills certifications should be consistent with ISO17024, the international standard;
- ease of access to knowledge so that:
  - larger organisations and the public sector can embed these skill sets into their organisations; and
  - medium and smaller organisations can readily access them; and
- enhance business understanding of the business value, competitive advantage and wider economic benefits of investing in decarbonisation.

Another comment noted the need for enhanced advisory and extension services to farmers to enable them to respond to pricing and accelerate the adoption of emissions-efficient practices, appropriate land use diversification, and emerging technologies to reduce gross emissions.

## D.2 Civil Contractors New Zealand

Contractors need extremely specialised and advanced skills in project tendering, contract and project management and reporting, in addition to business and people management skills. To these they are adding te ao Māori and mātauranga Māori skills and appreciation of treaty issues and te mana o te wai.

Staff of many contracting firms have degrees in engineering, resource management, terrestrial and aquatic ecology and more. Their sustainability managers are dealing with long term issues related to climate change, including emissions reduction and the associated energy and fuel efficiency in manufacturing and their light and heavy vehicle fleets, plus water and materials efficiency, solid waste minimization and supply chain sustainability.

These professional staff also play a leading role in supporting their front line staff to attend New Zealand Qualifications Framework and other vocational training courses, and many of them also deliver highly specialised training on the wide range of environmental topics listed in **Table 4**, which are all subject to legal compliance.

Having supported and witnessed such training over many years, I can attest to the high degree of professional and vocational skills needed across the sector – skills that straddle all the government outcomes relating to the four associations participating in this project.

Particular skills cited in CCNZ's recent submissions were:

- holistic understanding of infrastructure emissions – to consider whole of life emissions and account for construction, operational and decommission (demolition and recycling) emissions at the same time will help solve the above problem;
- how to use the ISO 14064 framework of greenhouse gas accounting and verification to calculate embodied carbon in infrastructure;
- emissions reduction guidance for transport and water construction;
- delivering climate-resilient infrastructure such as transport networks, seawalls, stopbanks and wetlands;
- better guidance, investigation and flexibility is needed around specifications for re-use and recycling of construction and demolition waste such as concrete, asphalt, aggregate, steel, and the mud/rock produced from tunnelling these materials, including transport or foundation engineering specifications;
- support for decarbonising heavy machinery and heavy vehicle fleets, e.g. include electricity, hydrogen, biofuels and new fuel efficiency measures;
- sustainable procurement and tendering;
- workflow planning and workforce skills development to support contractors in planning future investment in their people, plant and systems; and
- how to tap into the knowledge of aging professionals before it is lost as they exit the workforce.<sup>70</sup>

### D.3 WasteMINZ

The names of WasteMINZ's specialised sector groups indicate the broad scope of skills in the waste sector:

- behaviour change;
- contaminated land management;
- disposal of waste to land;
- health & safety;
- organic materials;
- product stewardship;
- recycling and resource recovery; and
- council roles and responsibilities.

WasteMINZ has identified that lack of training opportunities is a big issue in all waste sectors and has recently formed a working group to look into this.<sup>71</sup> The group consists of representatives from central government, local government, consultancy, and the community sector. The focus of the group is on office-based jobs such as those at councils, the Ministry for the Environment, consultancies, research and management jobs in the community sector, and office-based jobs at recycling companies. The group has identified a list of topics that would be helpful for people to learn about before employment in the sector and has met with Te Pūkenga staff to discuss content for a possible course at the tertiary level (Level 6-7). WasteMINZ's sector programme manager has also attended a meeting with Hanga-Aro-Rau (the Manufacturing, Engineering and Logistics Workforce Development Council) to look at a potential Level 2 (school age) course, and Level 3 and 4 courses or micro-credentials for those who are already working in the sector and may need further waste-related training.

An early draft of 101-level training needs identifies 12 high-level topics relating to waste avoidance, minimisation and management.<sup>72</sup> Each one listed below contains detailed skills required in its subtopic content:

1. Te Tiriti, mātauranga Māori and developing genuine relationships with mana whenua: three subtopics;
2. Legislative framework for waste in Aotearoa: three subtopics;
3. The role of local authorities in managing and minimising waste: 11 subtopics, some very detailed;
4. Circular economy, waste hierarchy and community engagement/education: three detailed subtopics;
5. Current waste management practices in New Zealand for a variety of waste types and management methods: nine topics, including landfills; recycling; reuse and repair; organic materials; recovery including waste to energy; product stewardship; import/export/levy systems; properties of materials and supply chain management; and chain of custody for recovered materials. These have 4-11 extremely specialised subtopics;
6. Management of contractual relationships: seven subtopics;
7. Measuring impact and forward planning: seven subtopics;
8. System Design: two subtopics;
9. Health and safety, including for hazardous waste: five subtopics;
10. Project Management: five subtopics;
11. Technical capabilities: three subtopics; and
12. Work-based opportunity such as placements where students spend six weeks at a council, consultancy or other organisation (optional).

Instantly recognizable to many, the waste hierarchy (which I call the resource hierarchy) shown in **Figure 9** was designed in 1975 by the European Union (EU) and included in the European Waste Directive to emphasise the importance of waste minimisation in the protection of the environment and human health.

While the New Zealand Government does not have a specific zero waste policy, waste minimisation will significantly contribute to its goal of transitioning to a net zero emissions economy by 2050. The Government is committed to achieving this and other positive environmental outcomes through its Sustainable Procurement Rules.<sup>73</sup>

However, WasteMINZ is also aware that while they are promoting actions at the top of the waste/resource hierarchy (where actions are the most cost-effective) such as repair, there is no training available for the new generation of people with the repair skills needed in every sector of the economy.

As another example, as well as enabling repair, product stewardship will avoid and reduce waste by enabling re-use, recovery and recycling of all waste including construction and demolition waste.

As with carbon, waste reduction needs tools and skills to take greater action on climate change across every sector of the economy. Specific skills needs are drawn from WasteMINZ's submissions to the legislation and policies in **Appendix B.3**.

WasteMINZ is working with Hanga-Aro-Rau (the Manufacturing, Engineering and Logistics Workforce Development Council) on training needs for vocational jobs in waste, such as truck drivers, recycling sorters etc.

Figure 9 A hierarchy of actions to get to zero waste

Source Zero Waste Europe. 2019. *A zero waste hierarchy for Europe*<sup>74</sup>



Government and council needs include:

- training to give effect to Te Tiriti, the te ao Māori worldview and mātauranga Māori (iwi and mana whenua also need resourcing here);
  - training for those setting up a national resource recovery network;
  - support to upskill, train and expand our central, regional and local government workforce to implement the *Taking Responsibility for our Waste Te kawe i haepapa para* strategy;
  - a national shortage of suitably experienced technical staff in councils to give effect to the purposes of the Natural and Built Environment Bill/Act;
  - increasing need for expertise from council resource recovery and planning teams to deliver Waste Management and Minimisation Plans, which require them to consider and incorporate the waste reduction provisions also included in reviews of Waste Bylaws, policies in Procurement, Sustainability and Climate Change and Capital Delivery programmes and associated construction and demolition waste management;
  - skills to efficiently collect, verify and store data;

- environmental reporting and ISO14001 certification skills;
- asset management of waste infrastructure;
- the right to repair depends both on the capture of knowledge that is being lost about how to maintain and repair items to extend their useful life, and also on its dissemination via education and community initiatives such as Repair Cafés and makerspaces;
- help for councils to research and deliver the best system to achieve the highest quality outcomes to transform recycling;
- more definitive tools and advice to ensure that decisions take into account circular economy principles at both a regional and national level; and
- support and regulation around changes to land management practices to help to address our organic waste issues in a way that maximises broad beneficial outcomes.

Business training needs include:

- more education and training programmes specifically targeted at businesses are needed to transition them from linear business models to circular business models; and
- sector-appropriate business programmes including zero waste education and sustainable production/procurement alongside programmes to educate business of the financial and profit benefits of adopting these initiatives.

Skills shared across government, business and communities include:

- food waste reduction;
  - capture and reuse of material from deconstruction projects for construction;
  - product stewardship; and
  - skills and training programmes (more than just public information and behaviour change campaigns) that equip New Zealanders for the circular jobs of the future, from repairing through to reverse logistics and reuse.

#### D.4 Water New Zealand

Water New Zealand notes that ‘it will be a struggle’ for the water industry to deliver on the current set of legislative and policy ‘changes and amendments and what the implications are! There is a shortage of all disciplines (at the moment) and of the diversity of skills needed to deliver water reforms’.

This is exacerbated by the many other reforms relevant to the water sector, including the planning and other reforms listed in **Appendix B.4**.

**Figure 10** illustrates the effects of urbanisation on the natural water cycle, which affects surface and underground water quality, terrestrial and aquatic biodiversity and stream flows, and results in flooding and contamination. Rain lands everywhere, and urban rainfall runoff is called stormwater. Some stormwater sinks into soils or groundwater, some runs over land into fresh or coastal waters and some enters piped infrastructure that discharges the stormwater into fresh or coastal waters.

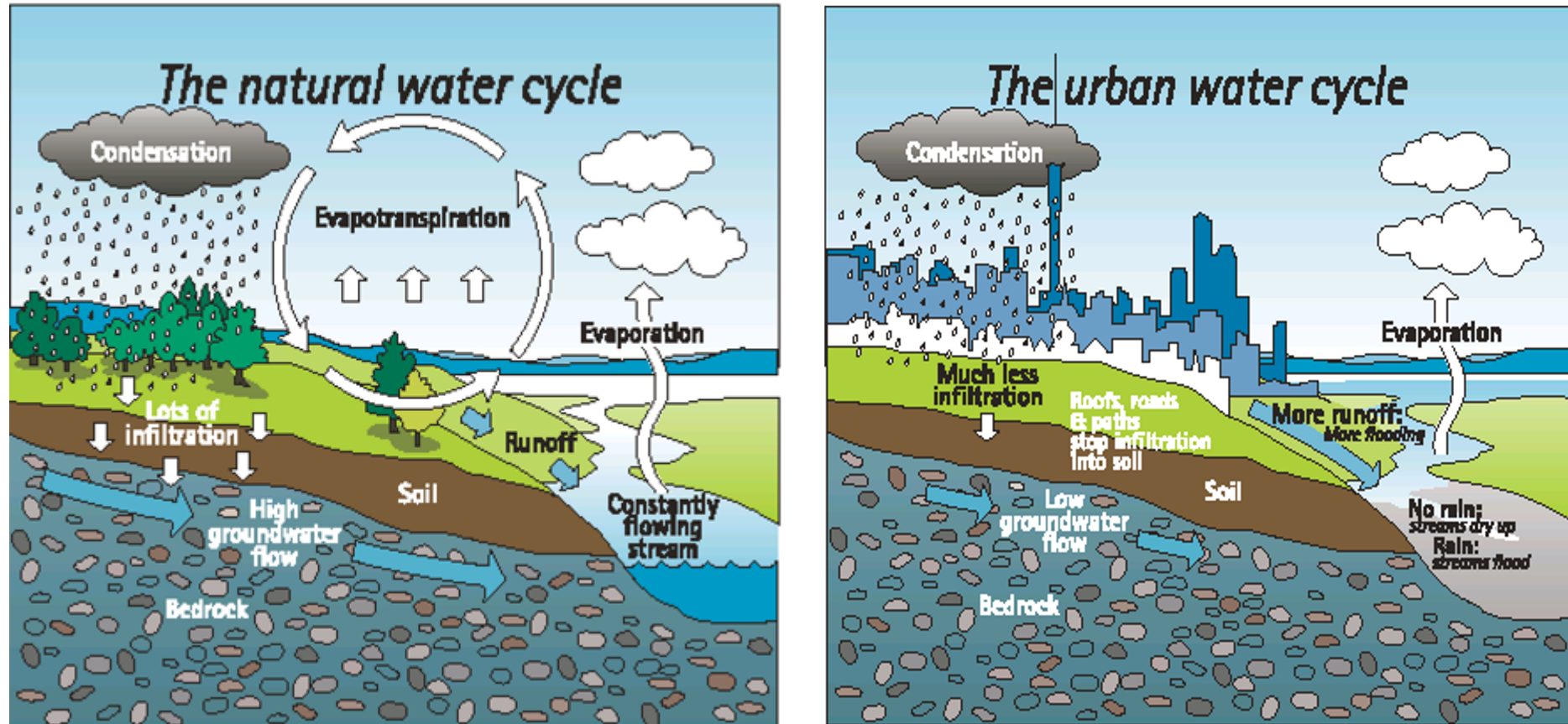
Not shown in **Figure 10** is the effect of large water takes for reticulated drinking water infrastructure and large discharges from reticulated sewer infrastructure of more or less treated wastewater into fresh or coastal waters

Also not shown are rural land uses, which also have significant effects on surface and groundwaters in terms of quality and quantity.

It is easy to see that land use planning and land use activities are the prime influencers of all three of these waters, as shown in the skills analysis for the water sector summarised next.

Figure 10 How construction affects the natural water cycle

Source Legacy Auckland City Council website (no longer available)



Comments from Water New Zealand on water-related skills include:

- building, maintaining and supporting the capability of a dedicated water services workforce is essential for the Water Service Entities to do their work;
- Councils will lose their three waters capability when the staff (and assets) transition to the WSEs and will have no skill or capability to be involved in three waters service delivery;
- Government funding is urgently needed to resource mana whenua to be active partners in the new systems that are being created. This will enable mana whenua to increase their capacity and capability to resource increasing co-governance, co-management, co-design and co-delivery expectations;
- a national building consent authority to provide leadership and operate alongside local building consent authorities' building consent services would support on-site systems qualifications and training;
- the Building Code does not require formal training or education of on-site stormwater and wastewater management system designers, regulators, installers and maintenance personnel, so these are designed and installed by personnel with varying levels of expertise, experience and on-the-job training;
- building consent conditions should include requirements that design, construction, inspection, maintenance and compliance inspections of:
  - on-site wastewater management systems be done by suitably trained, certified and authorised personnel;
  - site-specific stormwater systems be done by suitably trained and experienced professionals;
- a centralised training programme and qualification requirements are needed to provide a consistent accreditation baseline for onboarding new building control officers whole of life performance
- an efficient trade waste monitoring regime will require several agencies involvement to grow skills and capability to understand source and environmental risks of PFAS in trade waste and develop monitoring regimes and policies around consenting and management, including:
  - the considerable capacity and capability pressures constraining effective implementation of the National Environmental Management Plan for trade wastes;
  - the significant increase in skilled resource needed for trade waste compliance and monitoring;
  - the shortage of suitably qualified laboratory staff, environmental experts and process engineers to undertake reporting for guidelines, consenting, management frameworks and monitoring requirements for drinking water and wastewater;
  - the need for the Government to work closely together with Water New Zealand, the tertiary sector, public health experts and related member bodies including IANZ (International Accreditation New Zealand), Engineering NZ, Association of Consulting Engineers (ACE New Zealand) and the Institute of Public Works Engineering Australasia (IPWEA, now Apōpō) to put in place the support necessary to grow the sector and ensure the PFAS challenge can be understood and managed proficiently;
- the new systems proposed in the Natural and Built Environment and Spatial Planning Bills pose significant resourcing challenges for all sectors involved or impacted by resource management:
  - water sector constraints on capability and capacity to implement such transformative change while operating 'business as usual' and delivering on the three waters reforms;
  - significant skills capability and capacity resources required for regional spatial planning, developing and implementing Natural and Built Environment plans, national frameworks and guidance;
  - the transition to the new system will need transformational resourcing and in particular resourcing and capacity and capability development for iwi and hapū to engage;
- the 2020 Water Workforce Development report<sup>75</sup> addressed the need for (among other things):
  - Competency mapping: how might we build an adaptable workforce that enables credentials to transfer across roles and industries?
  - Iwi workforce development: How might we evolve from a slash culture (sic) and truly see industry workforces through the lens of mātauranga Māori?
- Water New Zealand's transformation vision for the water sector<sup>76</sup>: includes the need for:
  - investment in education and growing local talent development to ensure the workforce has the skills and knowledge to keep up with the latest technology and innovation; and
  - increased training around Te Mana o te Wai, which is intrinsic to sustainable outcomes.

## D.5 Environmental Communications Ltd

My submissions set out the need for a national CPD strategy for the professionals affected by the Government's reforms. I will present these in Phase 2 of this work. My capability comments are summarised below:

- the Government's many reforms include setting up Taumata Arowai, Te Pukenga and its associated sector arms as well as the Infrastructure, Climate Change and Productivity Commissions; and undertaking reforms relating to freshwater, three waters, biodiversity, vocational education, the Resource Management Act and local government. This creates a whole of nation enterprise to deliver current and intergenerational wellbeing;
- professionals in the water, waste, carbon and biodiversity sectors are strongly expressing their needs for training in order to adapt to the many new environmental laws, policies, regulations and other initiatives to which they must now give effect. This is an essential precursor to the development of the right training content for tradespeople;
- the value of working through industry associations to deliver this training, a key thrust of this report: it is far more practicable and cost-effective to resource an industry body to work with its members than to attempt to work with large numbers of individual organisations;
- the Resource Management Review Panel acknowledged the need for training on p481 of its 2020 report<sup>77</sup>, where it recommended that additional resources for the transition be provided for mana whenua and key agencies and says: 'The Ministry for the Environment should work with professional institutes and organisations to ensure those administering the reformed RMA (Resource Management Act) are appropriately equipped and upskilled to implement it';
- the RMA reform team must include stormwater and related professionals to maintain the focus on better outcomes of land use on water quality and quantity, surface and underground water catchments and their receiving environments and the associated human and ecosystem effects:
  - the intrinsic and intimate connection between rainfall runoff and land use means that the fundamental unit of land use planning and management of both natural and built environments must be the surface water catchment and its associated (and not always congruent) underground waters, together with their freshwater and coastal receiving environments;
  - There is no reference to stormwater. However the quality and quantity of runoff are determined by land use – be it virgin forest, primary production lands, residential or 100% impervious industrial or commercial land. If they are to succeed, the RMA reforms must start from a deep understanding and embedding of this significant relationship, or we will repeat the failures of the past;
  - Te Mana o te Wai is referred to in the 2014 National Policy Statement for Freshwater Management and in the 2020 Taumata Arowai–the Water Services Regulator Act and the accompanying Water Services Bill. It should also be included in the Natural and Built Environments Act;
- many of these sectors have long invested significant effort into identifying capability needs, gaps and providers and much of this work has been done on a voluntary basis by members of these associations. However the magnitude and urgency of the necessary energy transition means that these people need adequate resourcing to do this as an essential part of their core professional work;
- industry capability and capacity issues should also be considered in the context of the rapid evolution of new technology, access to real-time GIS-based data and exponential growth of data and ability to access data. Collectively, this situation both calls for and enables step shift changes in practitioner skill requirements and typical workflows to deliver practical and effective multi-benefit and monetised outcomes across all four wellbeings; social, cultural, economic and environmental. This can be achieved by engaging with multi-disciplinary practitioners during the development of legislation to ensure that the strategic and policy directives are able to be effectively and efficiently delivered by practitioners; and
- tertiary trades training and university education cannot address the shortage of planning and environmental skills in the timeframes the Committee envisages. Aotearoa New Zealand therefore needs an immediate strategic focus on professional training of the existing workforce. In the catchment management, civil construction, water, waste, carbon and biodiversity sectors with which we are familiar, professionals are strongly expressing their needs for CPD training in order to adapt to the many new environmental laws, policies, regulations and other initiatives to which they must now give effect.



The submissions above, from all parties, show how carbon, water and waste flow throughout the entire economy. The effects of the associated environmental skills gaps will likewise flow throughout the economy, in the form of reduced productivity and the creation of more problems than we are able to solve.

## Appendix E Mātāpono principles for a just Transition

Source: Will Allen, Troy Baisden, Jonathan Burgess, Sophie Crawford, Lisa Ellis, David Hall, Trish Hall, Ushana Jayasuriya, Merata Kawharu, Hannah Kotula, Catherine Leining, Sasha Maher, Oscar Montes de Oca, Ana Pueyo, Janet Stephenson, Sara Walton and Krushil Watene. 2023. *A Guide to Just Transitions for Communities in Aotearoa New Zealand*. Motu Economic and Public Policy Research, Wellington.

In Māori hapori, just transitions may be shaped by mātauranga and māramatanga enlightenment.

Below are nine fundamental mātāpono that may guide processes for working together. The specific interpretations of each and what they mean within community contexts need to be defined by those communities themselves (as informed by tikanga).

**Whakapapa:** Whakapapa is understood as genealogy, lineage or descent. It derives from ‘papa’, literally meaning layer or layering so that, for instance, one generation is layered upon another. As an organising principle, it orders the universe, connecting time past to time present. It can also be like a whāriki mat that weaves hunga ora the living, hunga mate those who have passed on and te taiao into a complex matrix of relationships. Whakapapa underpins who we are and guides what we do. It can provide the scaffolding for just transition processes by guiding responsibilities in relation to people and te taiao. Whakapapa essentially provides a broad context for just transition behaviour and action.

**Rangatiratanga:** Rangatiratanga is sometimes understood as autonomy, sovereignty, self-determination or customary leadership. But at the heart of rangatiratanga is trusteeship. As trustees, rangatira leaders act in the best interests of their community to help secure long-term benefits, based on ancestral precedent. Rangatiratanga is primarily about service. We often think of rangatira as those in established positions, particularly now in terms of those occupying positions within legal entities or in office roles. This holds true for organisations that are usually set up under Crown statute. But rangatiratanga also operates in other places. One is on the marae, where kuia and kaumātua elders and pakeke adults fulfil their roles. The marae is the central cultural locale for rangatiratanga expression, but there are others as well.

**Kaitiakitanga:** Kaitiakitanga is guardianship of te taiao and its resources. At the heart of kaitiakitanga is the idea of reciprocity between human and environmental interactions, recognising how each can support the other. It reminds us about learning from ancestral ways of doing things and of living well within environmental limits, with the goal of leaving the environment in a good or better state for future generations. Kaitiakitanga can guide actions needed to restore, rejuvenate, manage or conserve. These actions may utilise the best of mātauranga, māramatanga and tikanga, together with western science and technology. Sometimes, though, through māramatanga, communities recognise that environmental systems may provide their own solutions. We simply need to leave lands or waters alone to heal.

**Mauri:** Mauri is the life force, metaphysical essence or energy within a system that supports interconnected vitality. Mauri is present in lands, waters and all living things. From this perspective, just transitions are normally needed because mauri is out of balance or broken. The main point of a just transition is usually to restore, rebalance or rejuvenate this mauri.

**Mana:** Mana, or the idea of customary authority, status, power or stance, can be thought of as specific to a community. Having mana aligns with a community’s responsibility or duty to look after and care for their rohe. Mana guides what a community’s responsibilities are and what is needed for success.

**Manaakitanga:** Manaakitanga is caring for the needs of others and showing kindness. It is outward looking. It is a process of showing support and is about inclusion, monitoring and participation in just transition processes. Manaakitanga is similar to tika, or doing what is right, and may also be concerned with fairness. Determining what is fair is not easy. It may require hard discussions when weighing up cultural, economic, political or other competing interests. Trade-offs may need to be made.

**Oranga:** Oranga means wellness, wellbeing and good health. This applies not only to people or communities, but also to lands, waters, habitats, ecosystems and environments. Oranga also emphasises the importance of taking

a long-term view and acting now for intergenerational change. It is relevant to all just transition processes, reminding us that the health and wellbeing of people and te taiao are interwoven.

**Kotahitanga:** Kotahitanga means oneness or unity and expresses the idea of collective action or responsibility. There will not always be agreement on all things at all times, but alignment is needed on core kaupapa issues or plans. Those involved in a just transition need to have good problem-solving skills and an ability to recognise similarities and respect differences in perspectives or skills. The outcome of kotahitanga is the unification of possibly diverse interests into mutual interests and common goals to address a problem, moving towards better outcomes for the collective.

**Whanaungatanga:** Whanaungatanga, deriving from the word 'whānau', or family, is about building relationships and making connections. It creates a sense of belonging and helps people to work together for a common purpose. Whanaungatanga maintains community cohesion.

## Appendix F Integral, specialist, strategic and leadership skills for the stormwater sector

Source: Water New Zealand. 2021. *Water New Zealand Stormwater Training and Sector Development Strategy*. Draft for industry comment. September 2021. A report prepared by Clare Feeney, Environmental Communications Ltd, with the support of the Stormwater Education and Training Subgroup and many other members of Water New Zealand. Available for industry comment from the page at [https://www.waternz.org.nz/Category?Action=View&Category\\_id=1055](https://www.waternz.org.nz/Category?Action=View&Category_id=1055).

1. Integral skills	
Skills that are needed across all components of the water sensitive cycle	
1.1	Te Ao Māori and iwi leadership and engagement/naturalising te ao Māori/Te mana o te wai
1.2	Principles of sustainability and water sensitive design across the four wellbeings
1.3	Wellbeings Part 1: Introduction to cost sensitivity/life cycle costings, cost & benefit analysis of sustainability/WSD across the four wellbeings, including multidisciplinary engagement
1.4	Community engagement methods including positive communication & conflict resolution
1.5	Creativity and innovation
1.6	Train the Trainer training for environmental experts delivering non-NGICP training
1.7	Responsible procurement: how to identify, deliver and measure broader outcomes across the four wellbeings
1.8	Project management
Specialist skills	
2. Research, planning and governance	
2.1	Research, planning and governance: from research & policy to consenting & compliance; statutory & other methods, catchment governance – beyond the three waters
2.2	Monitoring and evaluation Part 1: how to define desired outcomes and indicators across the four wellbeings
2.3	WSD Part 1: Water sensitive/green/low impact design overview, principles, process design
2.4	Wellbeings Part 2: Costs and benefits of WSD and its alternatives
2.5	Risk and resilience, including climate change effects, mitigation and adaptation
2.6	Carbon reduction and transition engineering
2.7	Environmental law: legislation, policy, plans, initiatives, agencies, compliance and case law # *
2.8	How to prepare a consent application and assessment of impacts and outcomes
2.9	Managed retreat hard and “soft” skills
3. Catchment assessment and planning	
3.1	Catchment management planning: how to write an ICMP whose implementation and outcomes can be measured
3.2	Ecology Part 1: ecological, cultural, archaeological, social analyses
3.3	Asset planning and management, including mixed green and grey infrastructure
3.4	Hydrology including flooding, overland flow, bank/slope stability and hydrological modelling
3.5	Hydraulics and hydraulic modelling
4. Design	
4.1	WSUD Part 2: detailed design, from site characterisation to device design & sizing and stream daylighting
4.2	Wellbeings Part 3: BPO/MCA: best practicable option/multi-criteria analysis of all wellbeings
4.3	Fish Passage
5. Construction	
5.1	WSUD Part 3: How WSUD infrastructure and devices operate; fit-for-purpose construction; inspection (checklists, what to look for)
5.2	Ecology Part 2: Protection, capture and/or relocation of sensitive terrestrial & aquatic species
5.3	NGICP/Sensitive construction methodologies including subdivision-scale erosion and sediment control, small site erosion & sediment control and preventing pollution from other construction activities
5.4	Translating design into construction; sequencing construction; installing devices

<b>6. Establishment: ecological and amenity aspects</b>	
6.1	Establishment and care of stormwater and other plantings, including weeding and replacement
6.2	Ecological re-establishment, including introduction/reintroduction of terrestrial & aquatic fauna
<b>7. Handover</b>	
7.1	Legal aspects Part 1: subdivision-scale decommissioning of temporary environmental controls
7.2	Legal aspects Part 2: handover hold points, verification and rectification of asset condition
7.3	Legal aspects Part 3: small site-scale – environmental controls
<b>8. Green and grey asset operation</b>	
8.1	Green and grey asset operation with respect to desired levels of service
8.2	Ongoing point source contaminant control from industrial and other source premises
8.3	Ongoing diffuse source contaminant identification and control
<b>9. Maintenance</b>	
9.1	Inspection: the art and science of inspecting green and grey assets on public and private land
9.2	Proactive maintenance: planning, budgeting, implementing, documenting, learning
9.3	Reactive maintenance: budgeting, implementing, documenting, learning
<b>10. Monitoring and evaluation</b>	
10.1	How to measure and monetise the effectiveness of environmental training
10.2	The art and science of compliance monitoring
10.3	Wellbeings Part 4: How to measure the effectiveness of catchment and asset management plans across the four wellbeings as per the statutory analysis in 2.1 and 2.2
10.4	Wellbeings Part 5: how to capture costs and benefits at all stages of the water sensitive cycle to contribute to cost/benefit assessments & case studies
10.5	The learning organisation, evaluation and learning for adaptive and creative management
<b>Strategic and leadership skills</b>	
Strategic and leadership skills that develop the sector and benefit the nation	
11.1	Career pathing
11.2	Management training
11.3	Leadership training
11.4	Sustainability leadership training
11.5	MBA's (Masters of Business Administration)
11.6	Masters of Public Policy
11.7	Director training

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