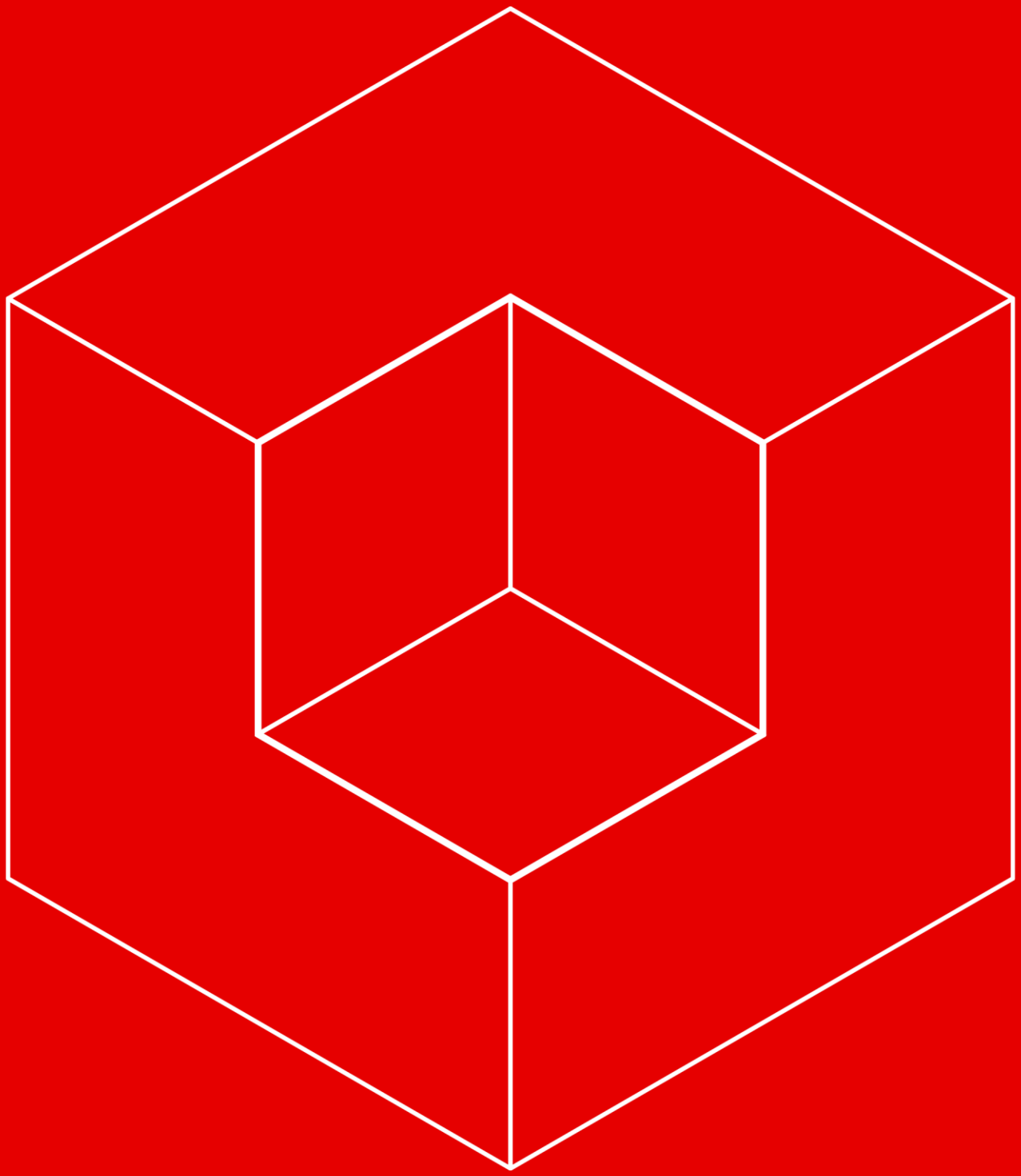
# Climate Change CPD Taskforce

## Research findings and proposed CPD program



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# Overview

Engineers Australia staff invited relevant contacts to submit an Expression of Interest (EOI) to contribute to the curation of CPD content focusing on sustainability. Just over 60 EOIs were received.

The respondents were invited to participate either in a group taskforce meeting, three were set up on different days and different times for one hour, or individually via research call or in writing.

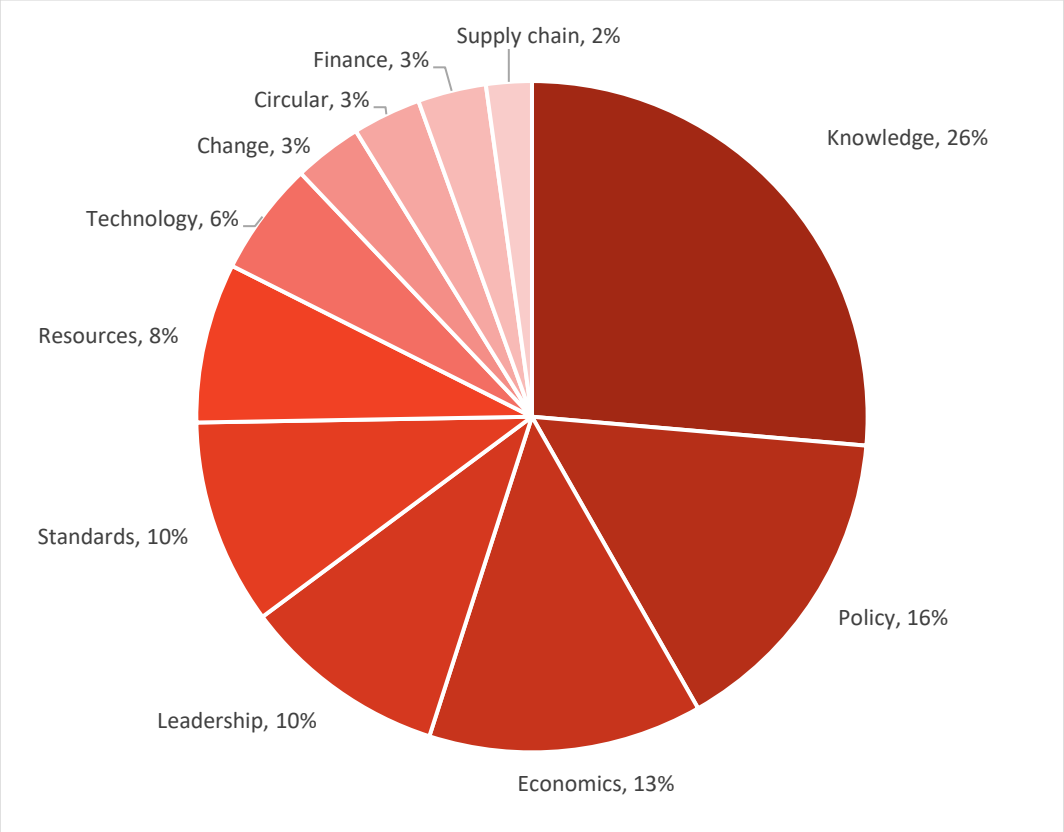
Over three weeks in March 2022, 35 participants (Appendix 1) contributed by providing their feedback and insights in relation to these questions:

1. What are the three main issues impacting sustainable engineering solutions on a day-to-day basis?
2. Do you see any trends impacting sustainable engineering?
3. What is an example of a great sustainable engineering solution?
4. Do engineers working in sustainability require any particular skills?
5. Who have you heard speak well on any of the suggested topics/subject areas?

Issues and trends provided in response to questions 1 and 2 were categorised based on the response's main theme/topic. Analysis of the feedback and the resultant CPD program are outlined below.

# Key issues

The categories to which the issues (identified during the research) relate, provide a high-level overview on what engineers consider to be the key areas hampering their ability to work in a sustainable capacity.




The pie chart illustrates, some 75% of the issues mentioned relate to one of five categories (knowledge, policy, economics, leadership, standards), with over 25% pertaining solely to knowledge.

One participant mentioned ***" the reality is that including sustainable considerations as part of your engineering role is only going to increase in importance".*** Awareness and knowledge of how to include sustainable considerations in the short term will become more important, but eventually will be a basic requirement for all engineers, no matter the discipline.

One of the most frequently mentioned issues (accounting for 16% of responses) was that engineers require certainty relating to government policy. However, as one participant pointed out ***"the federal government has set a net zero target by 2050 and some states have more ambitious targets than that".*** So, a national ambition for Australia to reach net zero by 2050 is already widely acknowledged as the federal government's principal sustainable policy. It would therefore be useful to understand what in addition to a clear policy it is that respondents require?

Another view could be that this issue is less about government policy, direction and regulations and more around engineers (or the leaders of engineering associations/organisations) having the confidence to change and amend technical specifications that do allow for low carbon. Alternatively, does this view warrant a process to be established that helps engineers interpret and implement government policy into their technical specifications? As one attendee pointed out ***"it is the engineers who own the specifications".*** What is clear is that the issue around policy will require further investigation.

The third largest categorisation of issues is around the economics of business, where profit over-rides sustainable considerations, however as one attendee noted ***"If all specs change to net zero; prices would increase, but only for a year as industry responds and the business case is made"***

Another attendee suggested a different way of looking at projects ***" redefine the means of measurement, not just financial, but social value, social benefits and in effect balance that with the social costs associated with flooding, drought, fire, etc"*** That then makes a very strong economic argument in favour of green lighting projects costing more now, but with longer-term benefits. Its these sorts of discussions and arguments that engineers need to be able to have, fluently.

The fact that ***"industry is leading the way and there's a lack of framework"*** should not be an excuse for not working sustainably as an engineer. Society and communities need sustainable engineering solutions and while the change is fast paced, engineers need to be at the forefront. The engineering profession needs to throw off the more traditional character traits of conservatism and adversity to risk, albeit safely, to contribute. Whilst (as Ruby Heard CPEng suggested at CSE21) ***" discarding the more traditional tenets of design (time, cost and quality) for a more virtuous framework including environment, humanity and equality."***

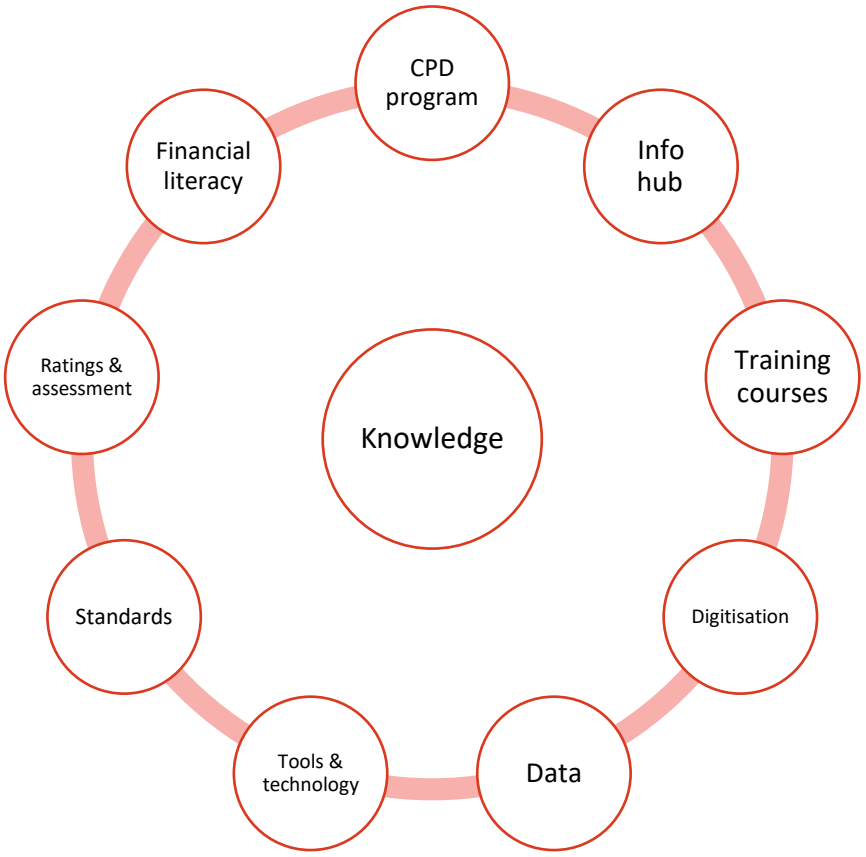
Access to proven solutions, technology and ideas that will assist engineers would be hugely beneficial, things like case studies, examples of projects or innovative solutions, a sharing of insights. If as mentioned a couple of times ***"all the solutions and all the technology already exists"*** then what is required is a means to disseminate that intelligence and knowledge more broadly.

Further issues identified related to finance, the sheer pace of change and the growing importance of the circular economy generally and more specifically on the work required around supply chain management.

What became apparent from the plethora of issues identified was that to drive the change engineers not only require a CPD program, but they also need:

- access to an information hub on which climate-related information is stored, e.g. case studies, subject matter experts, consultants, projects
- training in technological and other tools
- understanding of assessment and rating criteria
- access to the latest standards and an indication of how they may change in the future
- an appreciation of the impact that digitisation will have on data and how it will be automated
- the ability to interpret data, communicate insights and be able to make engineering decisions driven by data
- access and involvement in multi-disciplinary teams and an ability to break down the silos in which engineering disciplines appear to work

- some financial literacy.




This chart provides a representation of the different types of information and resource hubs that could 'solve' a number of the issues.

# Trends

According to these research sessions, these are the key trends driving the adoption of sustainability:

- the use of renewables (including water and hydrogen)
- finance sector
- construction industry
- data and technology.

Other identified trends included the transport sector, a systems approach, risk assessments and a growing prevalence for contractual models.

The adaptation and use of renewables was cited as the biggest trend and while this is a global trend, it is driven by Europe and America and decisions made there will impact Australia. For example, European car manufacturers all electric product ranges will inform Australian infrastructure. To compete for the same manufacturer's tenancy, governments need to be able to supply renewable-fed power grids.

As mentioned, sustainable measures are being driven by industry and in turn by banks and the finance sector. These institutions use rating tools, assessment criteria, environmental and financial reporting against a sustainable matrix particularly in the construction sector, which engineers need to be able to understand. This is further driven by the proliferation of sustainable construction products and procurement requirements to satisfy ratings for green buildings and an increasing number of client proposals specifying sustainable solutions are contributing to these trends.

Thus financial and climate literacy, carbon accounting tools, ESG reporting. ratings tools and assessment criteria all need to be in every engineer's tool kit.

Finally, digitisation is still a prevalent trend, with AI, sensors, automation and machine learning all contributing to projects involving living buildings and talking bridges, which now also generate data. Interpreting and understanding data to inform future projects by embracing growing automation and data driven decisions will be an unavoidable requirement of engineers in the future.

These trends are, to some extent, being driven by private and institutional investors who are demanding sustainability in everything, but it is the business and finance sectors of industry that are in the driving seat when it comes to thinking sustainability. This is also borne out with the legal profession's contractual models, the prevalence of ESG reporting, the growing adoption of renewable energy worldwide.

# Skills

Noted below are the range of skills that were mentioned as requirements for engineers in the future.

| |
|---|
| Adaptability and ability to change your thinking (engineers don't embrace change well) |
| Understand the bigger picture, holistic approach |
| Carbon accounting skills |
| Systems thinking |
| Communication (how to convey solutions future benefits, show graphs, visualise data) |
| Understand what financiers are after and can demonstrate benefits & economics |
| Innovative/Creative thinking |
| Project management |
| Collaboration |
| Problem solving skills |
| Project management |
| Lifecycle assessment and lifecycle analysis of procurement of works |
| Regenerative design |
| Challenge BAU by building confidence |
| Digital technology and understanding the latest technology |
| Understanding and awareness of unintended consequences |

The main observation is that all engineers need a high-level overview of sustainability or an ability to identify sustainable engineering. Engineers need to know how to practically push the sustainable agenda, suggest sustainable solutions and make the business cases for sustainability where it isn't mandated

In summary there is an expectation that engineers become the champions of sustainable solutions by understanding how decarbonising projects and products can fit in 1. the achievement of government mandated policies and 2. private and public projects.

# Suggested speakers

There were several speakers suggested to approach, either for a CPD program or as CSE keynote speakers, including:

| Name | Title | Company |
|---|---|---|
| Nicolas Stern | Chair | Grantham Research Institute |
| Ian Lowe | Emeritus Professor | Griffith University |
| Amory Lovins | Cofounder and Chairman | Emeritus of Rock Mountain Institute |
| Alan Finkel | Professor | Special adviser to the Australian Government on Low Emissions Technologies |
| Mike Cannon-Brookes | Co-founder/ CO-CEO | Atlassian |
| Saul Griffiths | Inventor, Author and Scientist | Otherlab |
| Allan Savory | Founder and President | Savory |
| Belinda Kennedy | Senior Program Officer | RMIT University |
| Ainsley Simpson | CEO | Infrastructure Sustainability Council |
| Mark Wild | CEO | Cross Rail Project (UK) |
| Romilly Madew | CEO | Infrastructure Australia |
| Ashleigh Morris | CEO | Coreo |
| Jaine Morris | Chief Operating Officer | Coreo |
| Kate MacKenzie | Climate Finance | Bloomberg |
| Elizabeth Sawin | Founder and Director | Multisolving Institute |
| Rob Rouwette | Senior Manager | Energetics |
| Marion Heathcote | Principal Trade Mark Attorney | Davies Collison Cave |
| Davina Rooney | CEO | Green Building Council of Australia |

# Proposed projects

These projects can effectively demonstrate the effectiveness of sustainable solutions. Those suggested have been collated here with links to the projects mentioned:

| Projects |
|---|
| Sugar industry example |
| Department of transport forNSW 1. design standards include green concrete; 2. Sydney congestion problem alliance |
| Sydney Water and Jemena Biomethane Project |
| Hybrit – Fossil free steel |
| House of Cards vineyard |
| Ecologiq |
| Buildings Midtown Centre QLD; Quay Quarter NSW; Great Portland Estates UK; Broadmeadows VIC |
| Space X reusing rockets – Falcon 9 |
| Buildings Alive |
| Project LEILAC |
| Fortescue Future Industries |
| Green Liveability project/structure |
| Boral |
| ISCA case studies |
| Port of Rotterdam |
| Bentley systems |

If you have thought of other speakers or projects that could be highlighted more broadly, please let us know.

# Proposed CPD program

These events are proposed based on a variety of suggestions made during the research phase.

| Date | Topic | Proposed speaker/company |
|---|---|---|
| 20 April (ahead of Earth Day on 22 April) | **Title**<br>Engineering a sustainable future<br><br>**Overview**<br>In this webinar James McGregor will talk about the role of engineering and innovation in addressing the world's most important to-do list, The UN Sustainable Development Goals.<br><br>Following the bushfires in 2020, COVID in 2021 and now the unprecedented flooding in NSW and QLD the role of engineering has never been more important.<br><br>As we approach Earth Day 2022 James will talk about emerging technologies, the opportunities for engineers to contribute to a more sustainable future, and give you some practical advice on how to scale the sustainability outcomes of your projects. | James McGregor CPEng, Founder, Blue Tribe<br><br>**Biography**<br>James McGregor is an Electrical Engineer and the Founder of the Blue Tribe Company and specialises in helping others create products, services, and even start-ups that solve some of the world's biggest environmental and social challenges.<br><br>Prior to founding the Blue Tribe Company in early 2017, James was the Project Director (Major Projects) with the CSIRO and was responsible for the project management, business development and commercialisation of major research programs including projects in biofuels, world record breaking solar thermal technologies, smart grid technology, intelligent agent based modelling technologies, low emissions power generation, and innovations in sustainable built environments.<br><br>He has been involved in the development of world record breaking solar technologies, has led projects to capture carbon dioxide from coal fired power stations, is the Executive Producer of an award winning TV show, and he has even served as a Cavalry Officer in the Australian Army.<br><br>He is now on a mission to make doing good, good for business. |
| June | Ecologiq (project list) | |
| August | How engineering firms practise sustainability | Arup, AECOM, Jacobs, GHD (case studies) and bringing together competing organisations to share their insights to benefit all engineering |
| October | Problem Solving (skills table) | |
| Nov | CSE Conference | Fortescue Futures Industries (invited) and other projects |

Depending on the relative success of these events and in consideration of other sustainable content proposed and scheduled by different groups of Engineers Australia, an annual program of content for 2023 will be proposed in the final quarter of 2022.

# Further suggestions

In addition to the information gathered to create the calendar above and the earlier suggestions around resources. The following table includes all the suggestions made by participants as to the roles that Engineers Australia could also be undertaking:

| Proposed roles for Engineers Australia (EA) |
|---|
| Provide engineers with sustainability and climate change adaptation and emission reduction strategies as part of the due diligence of their professional service provision |
| There's an opportunity for EA to consider how you fit in with all the education |
| EA's code of ethics should include sustainability (please see 4. Promote Sustainability) |
| How members need to influence the narrative and what is coming out of EA |

| |
|---|
| Professional competencies should include sustainability |
| Sustainability needs to be included in the accreditation of engineering courses |
| Consider the scenario of 3 degrees and ensure everything is built to that scenario |
| Talk to Standards Australia and look at housing/installation/ventilation standards |
| Encourage government to look forwards, not backwards |
| Structure of EA that has sustainability as a tech society when it should sit above all disciplines |
| Work with other groups |
| Lobby government |
| Develop structure for groups to work collaboratively with other disciplines and industry |
| Work with organisations/industry groups to break down barriers for mutual benefit |
| How are engineers educating government and select committees on the selection criteria required to allocate funding and grants? Engineers need input in the bureaucratic process |
| Influence in education and the way engineers are trained now |

# Conclusion

The taskforce meetings and research calls have delivered insights and action points well beyond the intended outcome of a CPD program.

From this collaborative process Engineers Australia has a timely perspective on the issues confronting engineers when prioritising sustainable and environmentally friendly solutions. In the main those issues are centred around knowledge, access to information, resources and tools, but additionally clarity around how to specify and work to government policy is required.

Engineers Australia are best placed to work through how to improve and upskill the Australian engineering workforce for the sustainable future that is needed.

Industry is undoubtably leading the pace of change with the growing adaption of renewable power globally, but this is just one example of how the finance and business sector is influencing the future, construction, transport and infrastructure are further examples. While project and solution success is traditionally based on profit, there is also a growing recognition that social value and future-proofing against the risks of climate change just make sense.

Technology, digitisation and data will all continue to drive innovation and if the pace is quick now, in all likelihood it is only going to get quicker.

Engineers need an adaptable, agile mind set to be comfortable in a face-paced changing environment, but it is a systems approach and muti-disciplinary engineering teams who are best placed to work through the requirements needed to reach net zero.

Engineers Australia will deliver the proposed CPD program, once ratified by the taskforce participants and will continue to develop training, courses, events, resources and information designed to upskill and educate engineers in sustainability.

# Appendices

# Appendix 1

**Participants**

| Total | Taskforce | | | Research call | Written response | EA members | Gender diversity |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | | | | |
| 35 | 11 | 8 | 9 | 6 | 1 | 23 | 10 Female/25 Male |

| First name | Surname | Title |
|---|---|---|
| Anne | Hellstedt | Technical Excellence Leader |
| Curt | Plumer | Industrial Product Group Manager |
| Fahim | Tonmoy | Associate Principal Engineer |
| Helen | Fairweather | Senior Lecturer, Environmental Engineering |
| Kip | Tanner | Director |
| Madoc | Sheehan | A/Prof Chemical Engineering |
| Suzanna | Remmerswaal | Associate Director - Sustainability & Resilience |
| Thomas | Cernev | Engineer; Researcher |
| Susan | Krumdieck | Professor in Mechanical Engineering and Chair in Energy Transition Engineering |
| Rebecca | McKenzie | New Energy Solutions Manager, Territory Generation |
| Arumugam | Sathasivan | Professor, Lead Sustainability Engineering Undergraduate Program |
| Adrien | Vigoulette | Mechanical Engineer |
| Andreas | Helwig | AProf Electro-mechanical Engineering, University of Southern Qld |
| Ari | Hammerschlag | Sustainability Team Leader |
| Clare | Parry | Director - Sustainability |
| David | Rice | Sustainability Advocate |
| Doug | Hargreaves | Aust Council of Eng Deans |
| Pamela | Chacon | Sustainability Consultant |
| Zoee | Shelley | Environmental Lead, Australia and Asia region |
| Andrew | Debeck | Associate Engineer |
| Fiona | Bowie | Sustainability Manager |
| Gareth | Clark | Sustainability and Building Physics Engineer |
| Graeme | Smyth | Associate Structural Engineer |
| Simon | Broner | Patent Attorney |
| Stuart | Khan | Director, Australian Graduate School of Engineering |
| Warren | Li | Senior Sustainability Engineer |
| Nur | Hassan | CQU College of Engineering and Aviation Lecturer |
| Carlos | Solis-Navarro | Principal Pavements Engineer |
| Bruce | Sanderson | Managing Director |
| Daniel | Lambert | Executive Manager - Sustainable Infrastructure Solutions |
| Adrian | Piani | ACT Chief Engineer |
| Kavya | Santhosh | Solar Asset Manager |
| Grant | Lukey | CEO & Managing Director of Coogee Chemicals Pty Ltd and Ministerial Taskforce - Future Battery & Critical Minerals Industries |
| Tom | Goerke | Managing Director |
| Peter | Lee | Emeritus Professor, FTSE, FIEAust |

# Appendix 2

## Issue categorisation

| Issue | Trend |
|---|---|
| One of the most difficult things with sustainability is that it's ever changing | Change |
| Keeping up to date with the speed of change eg specs, standards, products | Change |
| Codes and standards don't keep up with the rate of change of materials, apps, etc. Codes tend to look backwards but they need to predict the future | Change |
| Asset management in renewable industry (disposal of waste eg solar panels) | Circular |
| E waste management – recycling capability, truly green? Segregation of waste. Who? | Circular |
| Developing an industrial ecosystem to create a circular economy | Circular |
| Decision making on projects tend to use economic/financial/ROI | Economics |
| Performance standards and project deadline override materials, quality | Economics |
| Ethics around the decision making | Economics |
| A primary and sole focus on cost/economics and a total lack of appreciation of environmental impacts | Economics |
| Focus on short-term solutions from a financial perspective | Economics |
| Economics and political cycles are drivers for short term decision making | Economics |
| Cost/economics – sustainable solutions are the first things discarded in construction when budget becomes stretched. Value management should be integral. | Economics |
| Time – budget blowouts on the timeline impact the sustainable solutions | Economics |
| Industries and business work in isolation, need to come together/more partnerships | Economics |
| Means of measurement – financial, social value, social benefits, social costs eg floods | Economics |
| Competitive markets mean orgs use their trade secrets/solutions to further themselves | Economics |
| Economic struggle on a project between cost/what the client can afford and sustainability | Economics |
| How can we finance these solutions, what's the proper financing mechanism? | Finance |
| Requirements of sustainable projects driven by the finance sector | Finance |
| Financing | Finance |
| Many people are not aware of how to achieve the goal. No know-how | Knowledge |
| How can we finance these solutions, what's the proper financing mechanism? | Knowledge |
| Identify how we can upskill engineers so this is just something they all do | Knowledge |
| What are the internal things they can do to include sustainable solutions | Knowledge |
| Cost benefit analysis calculations from engineers to support sustainability | Knowledge |
| Embodied carbon cost benefit | Knowledge |
| Risk assessment project assessment tool | Knowledge |
| Awareness/knowledge of the considerations, it's getting better, new breed of grads and it's only going to increase in importance | Knowledge |
| New education eg principles of sustainability for all engineers, not just current grads | Knowledge |
| Requesting sustainable solutions retrospectively, not being proactive in thinking | Knowledge |
| Sustainability needs to be embedded in all engineering courses | Knowledge |
| Systems approach | Knowledge |
| Consider unintended consequences – ensure a solution doesn't make things worse later | Knowledge |
| We limit ourselves, look at brief and deliver business as usual – need to challenge | Knowledge |
| Regenerative interpreted differently and embedded in every project | Knowledge |
| The skill base of engineers when it comes to sustainability and keeping up to date | Knowledge |
| Education | Knowledge |

| | |
|---|---|
| Risk aversion due to lack of confidence | Knowledge |
| Educational skills, keeping up to date | Knowledge |
| What is contractual requirement and what is good? Making recommendations | Knowledge |
| Climate literacy engineers influence the brief to present solutions | Knowledge |
| Unintended consequences – acid rain | Knowledge |
| Negative impacts of sustainability on other areas without research/understanding | Knowledge |
| Lack of knowledge of potential impacts of climate change | Knowledge |
| The solutions to a lot of these issues already exist – the barrier to their implementation are at the project level ie decision making/leadership/knowledge | Leadership |
| Leadership not mandating sustainable solutions | Leadership |
| What are the internal things they can do to include sustainable solutions | Leadership |
| Industries and business work in isolation, need to come together/more partnerships | Leadership |
| We limit ourselves, look at brief and deliver business as usual – need to challenge | Leadership |
| Need for businesses to change and not continue with BAU | Leadership |
| Engineers work in silos so its an issue developing combined solutions (multi-dis teams) | Leadership |
| Guidance on sustainability has to come from the top eg transport authority framework | Leadership |
| All solutions all the technology needed to solve the problem have already been found | Leadership |
| Need clearer environmental policy from state and federal govt | Policy |
| Confused policy or advocacy issues that are not holistic | Policy |
| Lack of population policy | Policy |
| Govt and local govt are moving rapidly towards sustainability eg waste management, EV | Policy |
| Negative impact is the supporting policy and regulation, it doesn't exist | Policy |
| Fed govt not prepared to move on sustainability need a reform on policies | Policy |
| Government frameworks having enabling policy | Policy |
| Economic incentives | Policy |
| Policies that enable procurement of technologies or economic incentive | Policy |
| Government mandates | Policy |
| All states have policy and guidelines (net 0 2050), ACT leads an ambitious agenda | Policy |
| Certainty of government policy – business is 10 years, politicians 3 years | Policy |
| Government programs around grants and fundings (more hype and rhetoric) all the money allocated by one govt body for net 0 has had no impact | Policy |
| If Fed/State govt set targets for cities to reduce transport throughout it could cut GHG by 70% but it's not mandated on a city in that way | Policy |
| The solutions to a lot of these issues already exist – the barrier to their implementation are at the project level ie decision making/leadership/resources | Resources |
| Who are the consultants that engineers can talk to for sustainable solutions? | Resources |
| Allowing the engineering community to learn together and from one another | Resources |
| People working in different organisations want to see what other orgs are doing | Resources |
| Complexity and breadth (solutions focused within breadth of disciplines to bridge silos | Resources |
| Role of intellectual property regarding the sharing of solutions that could help | Resources |
| All solutions all the technology needed to solve the problem have already been found | Resources |
| Renewable Energy should have sustainability throughout and there are gaps | Standards |
| Different engineers go to different places and collect information | Standards |
| Overarching principle needs to be instilled from cradle to grave with four critical areas, 1. Materials 2. Packaging 3. Educating the user 4. influence | Standards |
| Standards and measures to guide engineers on how to implement sustainability | Standards |
| Industry is leading the way and there's a lack of framework/standards | Standards |
| Tech specs don't allow for low carbon | Standards |

| | |
|---|---|
| Steel spec for example – old specs don't account for new products (pace of change) | Standards |
| Tech specs sit with the engineer – the engineer has the capacity to specify net zero | Standards |
| If all specs change to net zero prices would increase, but only for a year as industry responds and the business case is made | Standards |
| Supply chain credentials – up stream and down | Supply chain |
| Renewable Energy should have sustainability throughout and there are gaps | Supply chain |
| Finding new (green) tech products - no overarching plan for sustainable purchase | Technology |
| Digital technology, data analysis, optimising existing systems and automate them | Technology |
| How can we automate reporting? Blockchain, real time, not annual reporting | Technology |
| smart contracts (digital law society) could be applied to policy and regulation eg digitally verify you've cut carbon, you automatically retain net zero qualification and apply credits | Technology |
| Fed govts lack of understanding of digital tech and not including it in net zero roadmap | Technology |

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