Clean Economy Workforce Development Strategy

Submission to the Victorian Department of Education and Training

14 April 2022

Executive Summary

The University of Melbourne welcomes the opportunity to contribute to the development of the Victorian Government's Clean Economy Workforce Development Strategy.

The University of Melbourne has identified addressing climate change and advancing the clean energy transition as a key strategic priority. To this end, it has established Melbourne Climate Futures (MCF) to connect and amplify the depth and breadth of our research, create a portal to share ideas and collaborate on real action and empower the next generation of climate policy leaders. The University is also home to the Melbourne Energy Institute (MEI), which delivers influential, interdisciplinary research on the transition to a clean energy system.

To date, we have pursued a number of initiatives to not only educate Victoria's future clean economy workforce but embed sustainability and clean principles in all aspects of the University's activities and teaching. The Sustainability Fellows program encourages faculties to consider how they can incorporate sustainability into their core and compulsory curriculum. In 2020, the Joining Melbourne Module 'Sustainable Communities & Campuses' was launched for commencing undergraduates.

Specific examples of the University's efforts to meet future clean economy workforce needs include: (i) the MCF Academy, which will be open to all students with a climate or energy-transition focus to their doctoral studies and; (ii) the Zero Emissions Energy (ZEE) Lab, which places graduate students in paid internships with industry partners to work on projects developing clean energy and transport technologies.

However, there are some key barriers and gaps in meeting this future workforce challenge. More work is required to integrate sustainability and clean economy concepts into a wider range of subjects. This will likely require a cultural shift that recognises that the clean economy extends into all facets of life. There are also gaps in clean economy research and teaching, such as climate finance.

The University is a partner on the Net Zero Australia project, which is calculating the number and types of jobs that will be required under different future climate scenarios. These results are not expected until later this year, but the University is nonetheless confident that the figures will pose challenging targets for our university and VET sectors and would be keen to discuss this work with the Victorian Government.

To meet those targets, we will need a much greater number of people pursuing STEM and technical VET, including many more women. It is likely this will also need to be complemented by skilled migration, given the immediacy of the demand.

Noting the size and scale of the challenge, a whole-of-sector response will be necessary. While the Victorian Government has so far focused on addressing skills needs in the VET sector through its Clean Economy Workforce Capacity Building Fund and Skills and Jobs Taskforce, involving higher education providers will be crucial.

The University therefore recommends that the Victorian Government establish a steering committee, made up of senior representatives from clean economy organisations, the tertiary sector, peak bodies, industry associations and government. This steering committee could work together to solve acute skills shortages by mapping out supply and demand issues and developing an investment plan to respond to these.

The Victorian Government could also consider other ways it could foster cultural change across the sector, hosting roundtables with university experts and senior public servants to discuss how clean economy concepts could be embedded across universities, including in non-STEM fields. The University would also encourage the Government to consider ways it could support clean economy university-industry linkages, including through internships.

To discuss this submission in more detail or to seek further information Professor Jacqueline Peel, Director of Melbourne Climate Futures, can be contacted on (03) 8344 1115 or j.peel@unimelb.edu.au.

Where does the clean economy sit as a strategic priority for the higher education and research providers?

Strategic priorities at the University of Melbourne

Addressing climate change and advancing the clean energy transition has been identified as a key strategic priority under the University of Melbourne's 2030 Strategy, *Advancing Melbourne*. The Melbourne Climate Futures (MCF) initiative was launched in 2021 to lead on this strategic priority at the University of Melbourne. MCF brings together researchers and expertise across all disciplines relevant to the climate and clean economy challenge, and partners with other institutes across the University with specialist knowledge in areas such as clean technology for the energy transition, community resilience and health, and Indigenous knowledge.

The Melbourne Energy Institute (MEI) was established in 2010 to deliver influential, interdisciplinary research on the transition to a clean energy system. MEI has over 300 specialists across Architecture, Economics, Engineering, Health, Law, Planning, Science and Social Science. MEI researchers work together in four programs: energy systems; hydrogen and clean fuels; power generation and transport; and environment and resources. Examples of its recent work include improved forecasting for Australian wind farms, supporting the Australian Energy Market Commission framework to enhance power system resilience, and establishing the Environmental Performance in Construction (EPiC) Database.

What is the level of awareness or planning within individual providers with respect to the clean economy? Does this differ across clean energy, circular economy, climate change mitigation and adaptation?

The clean economy – especially clean energy, climate change mitigation and adaptation – is a key area of focus and planning for the University of Melbourne through initiatives and institutes such as MCF and the MEI.

Melbourne Climate Futures

MCF's mission is to accelerate transition to a positive climate future. It does so by leveraging the breadth and depth of the University of Melbourne's climate research and its convening power and partnerships. It also does this by nurturing a next generation climate workforce with the skills and knowledge to take forward a clean economy through the MCF Academy (see further below) and working alongside the University in its own efforts to decarbonise. MCF's component research programs address all aspects of the climate mitigation and adaptation challenge, including climate systems science, health aspects, education needs, business sustainability and finance, land sector measures, intersections with water and biodiversity, social vulnerability and adaptation, policy, law, and regulation.

Melbourne Energy Institute

MEI has a complementary focus on interdisciplinary research on the transition to a clean energy system, with specific programs on energy systems, hydrogen and clean fuels, power generation and energy storage and optimisation of materials for energy applications. It also coordinates the Zero Emission Energy Laboratory (ZEE Lab), a program that places graduate students in paid internships with industry partners to work on projects developing clean energy and transport technologies.

To what extent are 'clean' concepts embedded within or across courses?

University of Melbourne Sustainability Framework

The University's *Advancing Melbourne 2030* Strategy articulates our aspiration to be leaders for a sustainability future, "through education and research, through our campuses and their operations, through partnerships and in the development of precincts intertwined with the city". The University's Sustainability Framework, which includes the Sustainability Charter, Plan and Report, commits the University to ensuring our campus operations, environments and engagement activities confront sustainability challenges using 'living lab' principles.

The Sustainability Report 2020 found that while clean concepts and sustainability had been integrated into some aspects of the University, there were still gaps and room for improvement. For example, in 2019, the Sustainability Fellows Program was launched. This established faculty-based Sustainability Fellows to lead the integration of sustainability into the University's core and compulsory undergraduate curriculum, foster deeper understandings of sustainability's relevance to all fields of endeavour, and contribute to the development of a University-wide, interdisciplinary community of practice. Four faculties have established Fellows so far.

In 2021, the University launched the Wattle Fellowship to nurture sustainability leadership in students selected from across all disciplines. The Joining Melbourne Module, 'Sustainability Communities & Campuses' was also developed and integrated into some core subjects (e.g., Discovery) and other undergraduate subjects. The Report notes that the next Sustainability Plan will propose the development of consistent approaches for both evaluating the extent to which sustainability is incorporated and facilitating deeper integration of sustainability into a wider range of subjects.

Clean concepts across faculties

Clean concepts are core to the Faculty of Science, particularly within the School of Geography, Earth and Atmospheric Sciences and the School of Ecosystem and Forest Sciences. For example, students in the Master of Ecosystem Management and Conservation can undertake subjects such as Forests, Carbon and Climate Change, which examines climate change science relating to forests and the role of forests in carbon sequestration and emissions trading. Researchers in the Faculty of Science are involved in numerous collaborative research ventures on clean concepts, including through the Australian Centre for Advanced Photovoltaics, the Clean Air and Urban Landscapes Hub, and the ARC Centre of Excellence for Climate Extremes.

In 2021, the Faculty of Engineering and Information Technology (FEIT) mapped courses from six University schools against the Sustainable Development Goals (SDGs). The intention was to establish the link between the sustainability curriculum and intended learning outcomes of undergraduate and postgraduate subjects offered by the University. This was part of a wider University strategy to embed sustainability knowledge and values in the university curricula. FEIT found that, based on the interim findings, there is scope to embed sustainability in more subjects within the schools.

The Faculty of Business and Economics has also mapped their activities against the SDGs for their UN Principles for Responsible Management Education report.

Are there any new courses or areas of growth in existing courses planned?

MCF Academy

The University of Melbourne has a long-standing doctoral program in climate and energy, with connections to universities based in Germany. As part of the launch and development of MCF, the initiative is expanding on this existing base to develop the MCF Academy. This Academy will be open to all students with a climate or energy-transition focus to their doctoral studies, with the opportunity to undertake a secondment with MCF in Melbourne Connect to connect with interdisciplinary climate expertise. In addition, MCF is offering strategic scholarships to broaden out the PhD cohort participating in the Academy to extend to students with a social science focus to their studies.

The MCF Academy will complement other leadership and industry partnership programs offered by the University of Melbourne to students in the climate and energy fields, such as MEI's ZEE Lab and the Wattle Fellowship program for Leaders in Global Sustainability.

Office for Environmental Programs

The University's Office for Environmental Programs (OEP) offers a leading professional environmental graduate degree. The OEP offers 11 specialisations, including climate change, conservation and restoration, and energy efficiency modelling and implementation.

How will research and innovation inform clean economy related teaching and training?

The University of Melbourne has a strong tradition of research-led teaching and training. This approach is supported by interdisciplinary research institutes and multidisciplinary initiatives established by the University, such as MCF and MEI.

ZEE Lab

The ZEE Lab is a new program, launched officially by MEI in February 2022, that supports applied projects with industry to reduce emissions and support the clean energy transition. It supports internships, PhD students and postdoctoral fellows and provides professional development activities for the entire cohort.

The ZEE Lab is supported by $4.7 million in Victorian Government funding via the Victorian Higher Education State Investment Fund, matched by cash and in-kind funding from the University of Melbourne and the clean energy and transport sector.

The initiative has supported 30 internships, 15 PhD students and 18 postdoctoral fellows. However, the University proposes to expand this effort substantially over the next three to five years. The ZEE Lab nominally makes up 25% of MEI's current activity with industry; MEI is also undertaking significantly more industrial research beyond this.

Other efforts to inform clean economy teaching and training

In addition to the previously mentioned Joining Melbourne Module, further examples of research and innovation informing clean economy related teaching and training include:

- Melbourne Accelerator Program (MAP) – MCF is in discussion with MAP about supporting their work, recognising the potentially important role of start-ups in creating clean economy solutions.
- MCF Academy – once launched, the Academy will support a traditional research seminar program open to all.

To what extent do staff overall have the capability to deliver clean economy related teaching and training? Are there particular skills gaps? Are these technical in nature (e.g., energy assessment) or general capabilities (e.g., awareness of concepts and business models)? Are there challenges in translating research findings into teaching and training programs?

Clean economy expertise

The University of Melbourne has strong existing research capability in clean economy areas that underpins its teaching and training. Particular areas of strength include: clean energy technology and energy materials; land sector measures including soil carbon capture; carbon neutral agriculture and forestry; water planning and infrastructure; climate adaptation and urban resilience; health impacts of climate change and extreme weather; Indigenous knowledge and caring for country practices; sustainable business practices; climate governance; and climate law.

Through the MEI, the University also has expertise in energy systems; hydrogen and clean fuels; power generation; and transport and energy materials. This ranges from the technical economic and environmental analysis of energy networks, wholesale and retail energy markets and energy system planning to work on materials for energy generation, storage, transport and consumption.

Skills gaps

MCF has identified climate finance, including developing and implementing business models that support the transition to a clean economy, as a key skills gap. This gap exists more generally across Australian universities, many of which are seeking to build greater capability in this area. The circular economy at a concept/system-level is also a skills gap, stemming from a lack of researchers working in that area.

Additionally, there are many areas in which Australia needs higher level technical expertise and capacity to train people in clean energy and clean transport. The MEI and MCF are working to address skills gaps including:

- Green hydrogen production using industrial electrolysis
- Hydrogen processing and use
- Power system engineering for renewable-rich systems.

Net Zero Australia project

To better understand these skills gaps, the University of Melbourne formed a collaborative partnership with the University of Queensland, Princeton University and Nous Group on the Net Zero Australia (NZAu) project. This project is calculating the number and types of jobs that will be required under different future climate scenarios, with the results expected in Q3-Q4 2022. The University is nonetheless confident that those figures will pose challenging targets for our university and VET sectors. The University would be happy to brief the Department further on this work.

What are the key gaps or challenges for higher education providers in supporting the transition to the clean economy?

Women in STEM

One of the key challenges in supporting the transition to the clean economy is that there are simply not enough people pursuing STEM and technical VET pathways in Australia. This shortage is exacerbated by the underrepresentation of women in STEM at the school, tertiary and professional levels, despite recent efforts to increase participation rates. In 2019, women made up less than a quarter of tertiary students studying STEM.[1] This underrepresentation is particularly apparent in engineering courses, where women comprised 18% of university enrolments and 10% of VET enrolments in 2019.[2] This failure to engage such a large group flows through to the workforce, meaning that there is a considerably smaller pool of workers for the clean economy.

Noting this issue, the University of Melbourne is committed to increasing the representation of women in STEM for both staff and students. For example, the Athena SWAN STEP (Supporting Talent and Enabling Progression) program, launched in February 2022, provides targeted mentoring for female academics wishing to apply for promotion from Level C to D. This complements the Academic Women in Leadership (AWIL) program, which seeks to support academic women leaders' growth and the fulfilment of their career goals.

The University's STEM faculties also pursue targeted recruitment of women and provide grants and scholarships to increase the number of women in those fields. The Engineers Australia National Committee for Women in Engineering recently recognised the Faculty of Engineering and Information Technology at the 2021 Gender in Diversity Awards for their comprehensive program of work to build women's representation in a traditionally male-dominated discipline.

Skilled migration

Given the large, urgent skills gaps currently present in the clean economy workforce, there is a need to complement increased education and training with greater skilled migration in the sector. This could partly be resolved through advocating for better post-study work rights for Australian graduates in related fields, noting that international students made up nearly half of the Engineering and Related Technologies enrolments in 2019, for example.[3] Not only would this help resolve some of the immediate skills gaps, but it would make Victoria more attractive as an education and training destination for students from overseas. This is an enormous opportunity for Victoria as a State that greatly values tertiary education.

Interdisciplinary challenges

A further challenge is that transitioning to the clean economy requires a workforce that has depth in a particular discipline and also the capacity to work across and harvest insights from a broad range of disciplines, given the complexity and interconnected nature of climate and clean energy challenges. Providing an interdisciplinary environment for education and training with links to future employers is a key challenge.

[1] Department of Industry, Science, Energy and Resources, STEM Equity Monitor 2021, https://www.industry.gov.au/data-and-publications/stem-equity-monitor
[2] Ibid.
[3] Department of Education, Skills and Employment, International Student Diversity at Australian Universities Discussion Paper, February 2022 https://www.dese.gov.au/australian-strategy-international-education-2021-2030/resources/international-student-diversity-australian-universities-discussion-paper

How can government work with you to better understand and anticipate the education and training needs for the clean economy? What information sources does it rely on? Can government play a greater role? How should information be most effectively shared?

As indicated above, the University is currently working on analysis of future skills needs for the clean economy through the NZAu project. However, the University welcomes the Victorian Government's support to help meet the education and training needs for the clean economy. Noting the challenges outlined elsewhere in this response, this issue will require multi-decadal efforts, with education policy informing industry policy and vice-versa.

Establishment of a Clean Economy Workforce Steering Committee

The University notes that the Victorian Government has established the Clean Economy Workforce Skills and Jobs Taskforce and the $6 million Clean Economy Workforce Capacity Building Fund. However, these are focused on the TAFE and training sector. Skills gaps exist at all education and training levels, including in higher education. Addressing the enormous challenge of transitioning to a clean economy will require a consolidated and joined-up approach, which includes both higher education and vocational education providers.

To do this, the University proposes that the Government establish a steering committee, made up of senior proponents from clean economy organisations, the tertiary sector, peak bodies, industry associations and government. This steering committee could work together to address acute skills shortages by mapping out supply and demand issues and developing an investment plan to respond to these.

Other opportunities to support workforce development

Other opportunities for Government to play a greater role include holding roundtables with senior government representatives and university faculty leadership to discuss integration of clean economy principles in teaching and learning across all fields of study. The Victorian Government could also consider ways it could encourage partnerships between universities and industry on clean economy concepts, including through internships.


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