ENGINEERS
AUSTRALIA

Planning Australia's skilled migration program

Submission to the Department of Home Affairs

December 2021

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1. Introduction

1.1 About Engineers Australia

Engineers Australia is the peak body of the engineering profession in Australia. We are a professional association with about 105,000 individual members. Established in 1919, Engineers Australia is a not-for-profit organisation, constituted by Royal Charter to advance the science and practice of engineering for the benefit of the community.

Engineers Australia maintains national professional standards, benchmarked against international norms. As Australia's signatory to the International Engineering Alliance, this includes accreditation of undergraduate university engineering programs. Furthermore, Engineers Australia manages Australia's largest voluntary register for engineers, the National Engineering Register (NER).

Under the Migration Regulations 1994, Engineers Australia is the designated assessing authority to perform the assessment of the potential migrant engineering professionals' skills, qualifications, and/or work experience to ensure they meet the occupational standards needed for employment in Australia.

1.2 Submission structure

In this submission, Engineers Australia demonstrates that demand for engineers in Australia will always outstrip supply from domestic entry level graduates. A skilled migration program will, therefore, always be needed. However, what matters more is how the migration program is structured to ensure it delivers on the policy outcomes that include increased national engineering capability. In this regard, change is necessary.

- Section 2 is an executive summary of Engineers Australia's primary issues for consideration.
- Section 3 provides the context in which the migration program should be viewed with regard to skilled migration that targets engineers.
- Section 4 is a detailed introduction to the migrant engineering workforce and the challenges they face, once onshore, with regard to securing meaningful employment that is aligned to their level of expertise.
- Section 5 are responses to the specific questions posed in the Department of Home Affairs' discussion paper.

Three appendices are provided to illustrate the key attributes of the Australian engineering labour force generally, plus demand and supply considerations.

1.3 Data sources

The data shared in this submission is mostly based on Engineers Australia analysis of the 2016 census. References taken from this analysis is not footnoted, but is available from two Engineers Australia reports:

- Australia's Engineering Capability: How the last ten years will influence the future (2019)[1]
- Engineers and Industry: A decade of change (2019)[2]

Other Engineers Australia reports used in this submission are as follows:

- Barriers to employment for migrant engineers: research report (2021)[3]

[1] Andre Kaspura, *Australia's Engineering Capability: How the last ten years will influence the future* (2019) Engineers Australia <https://www.engineersaustralia.org.au/sites/default/files/Australia%E2%80%99s%20Engineering%20Capability%20-%20digital%20-%2020190207.pdf> at 30 March 2021.
[2] Mark Stewart, Engineers and Industry: A decade of change (2019) Engineers Australia <https://www.engineersaustralia.org.au/sites/default/files/Engineers%20and%20Industry%20-%20digital%20-%2020190211.pdf> at 30 March 2021.
[3] Justine Romanis, *Barriers to employment for migrant engineers* (2021) Engineers Australia <https://engineersaustralia.org.au/sites/default/files/resource-files/2021-10/barriers-employment-migrant-engineers.pdf> at 26 November 2021.

- Australian Engineering Employment Vacancies: 2020 Trends (2021)[4]
- Australia's Next Generation of Engineers: university statistics for engineering (2020)[5]
- The Engineering Profession: A Statistical Overview, Fourteenth Edition (2019)[6]
- Engineers Make Things Happen: the need for an engineering pipeline strategy (2017)[7]

1.4 Contact details

For a discussion about the issues raised in this submission, please contact Jonathan Russell, General Manager for Policy and Advocacy, at JRussell@engineersaustralia.org.au.

[4] Sybilla Grady, *Australian Engineering Employment Vacancies* (February 2021), Engineers Australia <https://www.engineersaustralia.org.au/sites/default/files/Engineering%20Vacancy%20Trends%202020.pdf> at 29 March 2021.
[5] Andre Kaspura, *Australia's Next Generation of Engineers: university statistics for engineering* (2020) Engineers Australia <https://www.engineersaustralia.org.au/sites/default/files/Higher_education_statistics_2020.pdf> at 29 March 2021.
[6] Andre Kaspura, *The Engineering Profession: A statistical Overview* (14th ed, 2019) Engineers Australia <https://www.engineersaustralia.org.au/sites/default/files/resources/Public%20Affairs/2019/The%20Engineering%20Profession%2C%20A%20Statistical%20Overview%2C%2014th%20edition%20-%2020190613b.pdf. at 29 March 2021.
[7] Andre Kaspura, *Engineers Make Things Happen: The need for an engineering pipeline strategy* (2017) Engineers Australia <https://www.engineersaustralia.org.au/sites/default/files/resource-files/2017-03/Engineers%20Make%20Things%20Happen.pdf> at 29 March 2021.

2. Executive summary

Australia is experiencing a challenge with engineering skills supply. Some sectors are experiencing a shortage of experienced engineers that is exacerbated by chronic challenges in the sources of domestic supply, but in the face of an economy-wide oversupply of qualified—but underutilised—migrant engineers. The long-term solution involves:

- significant investment in young people, and the support they need to consider and succeed in further studies and a career in engineering.
- industry-led development of early career graduates, and
- community-wide understanding of the value of migrants.

At the 2016 census, 58.5% of engineers in the Australian labour force were born overseas. The skilled migration program, including its various visa classes including permanent and temporary, are essential to the nation's engineering capability.

Engineers Australia therefore supports skilled migration across all visa categories to fill perpetual gaps in the domestic supply of engineers to meet the needs of the country now and into the foreseeable future.

However, continuing large scale intakes of qualified engineers will not further develop Australia's engineering capability unless action is taken to modify the migration program to ensure a better fit for the policy objectives, and more support is provided to migrants and employers to ensure better employment outcomes.

The material provided in this submission complements our March 2021 submission to the Australian Parliament's Joint Standing Committee on Migration inquiry into the skilled migration program.[8] That submission focussed on broad and high-level policy settings to ensure the program would meet national objectives of migration.

This submission to the Department of Home Affairs touches on the same issues but has a focus on aspects that are likely to be addressed in the design of the skilled migration program in the short term, plus advice for structural improvements to cross-departmental reform over the long term.

Responses to the consultation paper questions is provided at Section 5.

2.1 Issues facing the migrant engineering population

Of those who arrived from 2007 onwards to the time of the 2016 census, the top country of supply was India which supplied 23,217 and the top 10 nations supplied two-thirds of all migrant engineers (so, the supply source is very concentrated).

Migrant engineers are much more likely than Australian-born engineers to work in non-core industries, which indicates that they are also much more likely to work in non-engineering roles. This trend is true of migrants regardless of arrival date and is most pronounced for recent arrivals. (See Appendix A for an explanation of 'core industry').

The concern is that migrant engineers are arriving in Australia to meet a policy objective of enhancing domestic engineering capability, but we are only making effective use of 49% of them (that being the proportion who work in engineering roles). This figure—49% of migrant engineers working in engineering roles—compares very poorly with 66% for Australian-born engineers. One half, compared with two-thirds.

The difference in employment outcome for migrants as compared to Australian-born engineers is significantly worse, both in terms of utilisation in engineering roles and raw unemployment, especially for women and those in regional capitals.

Labour force participation in 2016 for overseas-born qualified engineers who arrived from 2012 onward has fallen well below rates for other, earlier, arrival cohorts, and for Australian-born qualified engineers. Irrespective of when

[8] Engineers Australia, *Australia's skilled migration program: Submission for Joint Standing Committee on Migration inquiry* (2021) <https://www.engineersaustralia.org.au/sites/default/files/Australia's%20skilled%20migration%20program%20(Cth%2C%20March%202021).pdf> at 26 November 2021.

they arrived, overseas-born engineers experience higher unemployment rates than Australian-born engineers do, with recent arrivals experiencing higher rates than in the unskilled labour force segment.

These figures suggest that continuing large scale intakes of qualified engineers will not significantly develop Australia's engineering capability, unless if action is taken to modify the migration program to ensure a better fit for the policy objectives, and more support is provided to migrants and employers to ensure better employment outcomes.

At the time of the 2016 census, the unemployment rate for engineers generally was 6.0%. However, the situation for migrants is put into stark relief if overseas-born and Australian-born engineers are examined in isolation. For Australian-born engineers the unemployment rate was 3.7%. For migrants it is 7.6% (6.9% for men and 11.3% for women).

Of the top 10 migrant groups by country of origin, which deliver 67.1% of all migrant engineers, all have higher rates of unemployment than Australian-born engineers. For those from India, China, Iran, Malaysia, Pakistan and Bangladesh, the differences are stark. The only source countries that come within one percentage point of the Australian-born rate are England and South Africa.

The census data also suggests that attempts to use the skilled migration program to boost employment and productivity in regional Australia is, to a significant extent, underperforming. The opportunity to boost domestic engineering capability with new migrants is inefficient—it takes too long to get new migrants into employment.

Engineers Australia's analysis also demonstrates that, for those same groups of migrant engineers, those who are employed are much less likely than Australian-born engineers to work in engineering roles—again, except for those from England and South Africa.

Unfortunately, there is very little hard evidence to explain the reasons for the employment outcomes of migrant engineers.

A recent survey conducted by the University of Technology, Sydney (UTS) into employment barriers for skilled migrant engineers identified the following as the potential top three barriers to employment for migrants: lack of local experience; lack of local references; not a permanent visa holder or citizen. The same research identified some key solutions to employment, these being: internship opportunities; mentoring programs; re-skilling/upskilling.

2.2 Causes of poor migrant employment outcomes

Engineers Australia has recently completed research to understand employment outcomes for migrant engineers.

The research identified seven barriers that employers and recruiters perceive to hiring overseas-born engineers. These range from a lack of local knowledge and experience to perceived differences in soft skills, and a lack of local people who can 'vouch' for these engineers. On a more individual level, barriers also encompass visa or sponsorship working rights issues, and concerns regarding international certification validity and perceived 'flight risks'.

Based on the research results contained in our report, *Barriers to employment for migrant engineers*, Engineers Australia sees six main opportunities to address these barriers:

1. Positioning migrant engineers as a collective talent pool and talking to the size of the opportunity for employers
2. Providing credible, trusted information on employment pathways for migrant engineers
3. Increasing local networks by developing networking and sponsorship programs/opportunities for migrant engineers
4. Coordinating initiatives to build local knowledge and experience of migrant engineers
5. Assisting humanitarian visa holders with their credentials assessment
6. 'Making it easy' for employers to access the talent pool.

The report, *Barriers to employment for migrant* engineers, is available online at https://engineersaustralia.org.au/sites/default/files/resource-files/2021-10/barriers-employment-migrant-engineers.pdf.

2.3 Further information

For an overview of the Australian engineering labour force generally, please see Appendices A-C. These include:

A. Basic characteristics of engineers in Australia, industries of employment and location of employment.

B. Supply of engineers, including domestic students and an introduction to overseas students in context and their value to the overall skills pipeline.

C. Demand for engineers, an historical perspective, an overview of current demand, and why there is a need for more data on demand.

2.4 Summary of recommendations

At Section 5, the following specific recommendations are made:

- All engineering occupations should be included on migration skills lists.
- More support should be provided to migrants and employers to help ensure their employment outcomes are as good as Australian-born workers.
    - This is especially important for those who arrive via the following pathways: Skilled independent, State/territory nominated, Regional.
    - It is also essential to apply a focus on women because overseas born female engineers have almost three times the unemployment rate of Australian born female engineers.
- Recommendations 1 and 2 of the Australian Parliament's Joint Standing Committee's Final Report of the Inquiry into Australia's Skilled Migration Program should be accepted by Government and implemented.
- The points-based system should be reviewed to ensure it does not create unintended consequences in the supply of migrants or their employment outcomes onshore.
- The regional sponsorship program should be reviewed, and consideration given to freeing migrants of their obligation to remain in the regional area after a shorter period of time, such as six months.

3. The engineering skills supply challenge

3.1 Overview

Australia is experiencing a challenge with engineering skills supply. Some sectors are experiencing a shortage of experienced engineers, but it is in the face of an economy-wide oversupply of qualified—but underutilised—migrant engineers, and is exacerbated by chronic challenges in the sources of domestic supply. The long-term solution involves massive investment in schools, industry-led development of early career graduates, and community-wide understanding of the value of migrants.

The difficulty facing Australia's supply of engineers is multifaceted. The immediate situation stems from an increase in demand at a time when borders have been effectively closed for almost two years. Driving demand is ongoing investment in public infrastructure, a re-emergence of demand for minerals, and a global transition to clean energy and adapting to climate change. While stated in this way it sounds like a simple issue to resolve: when international borders re-open and skilled migration picks up the issue will lessen.

However, Engineers Australia research shows there is a significant cohort of migrant engineers already in Australia who have long-term difficulties in securing employment appropriate to their experience. Returning to pre-COVID migration patterns would therefore be an inefficient solution.

Also, many of the demand drivers in Australia are simultaneously experienced by competitors for, and suppliers of, a migrant workforce. Relying on skilled migration puts the nation at risk of perpetually recurring skills supply problems.

Unfortunately, domestic supply channels are already exhausted. Anyone who wants to study engineering and meets the entry criteria is already accepted to university. Until the number of school students who study appropriate preparatory subjects increases, and more students (especially women) are inspired to become (and remain) engineers, there is no more domestic supply available. Therefore, domestic supply needs to be radically improved.

Finally, employers do not invest enough in graduates and instead focus on hiring people who have been developed to mid-career standard by someone else.

3.2 Drivers of skills demand

Engineers have been in the spotlight recently with several Australian Government initiatives relying on the skills and expertise of the engineering profession. Nuclear submarines, Australia's modern manufacturing strategy, increased infrastructure spending, the future of fuels, electricity generation and Australia's commitment to combating climate change all have a strong engineering component. These demand drivers require engineers who are competent in developing new and innovative ideas as well as translating those into products and services. COVID-19 border closures has also highlighted Australia's reliance on migration for engineering skills. 58.5 percent of Australia's engineering labour force are engineers who are overseas-born, compared with 30% for the general population. These factors have contributed to a perceived shortage of engineers currently available.

The most prominently affected occupations currently being reported as having a shortage are mid to senior civil, structural, electrical and mining engineers. There are also reported shortages for emerging skills such as cyber engineers, control system engineers and electrical engineers with experience in renewables and clean energy projects. The National Skills Commission predicts several engineering areas which will be in strong future demand. Engineering skills included in the priority skills list are civil engineers, structural engineer, electrical engineer, mining engineer (excluding petroleum), transport engineer, mechanical engineer, petroleum engineer, software engineer and geotechnical engineer.[9]

[9] 'Skills Priority List' *National Skills Commission, Australian Government* (accessed Friday 22 September 2021) https://www.nationalskillscommission.gov.au/our-work/skills-priority-list

Developing a pipeline of engineers with the required future skills should be at the forefront of both government and industry initiatives to ensure the profession is able to meet the challenge. Increasing our supply of domestic engineers is critical to the long term prosperity of the nation as is improving migrant employment opportunities. Furthermore, governments and industry need to avoid boom-bust cycles which lead to an unsustainable increase in certain skills for a period before dropping off.

The COVID-19 pandemic has made predicting the future labour market much harder. More certainty in modelling will be available post-COVID. Furthermore, a federal election in early 2022 means long-term government priorities may shift. By all accounts though, demand for engineers is very unlikely to reduce and without action across the three primary areas of school to university supply, early career development and retention, and efficient utilisation of migrants, we are likely to continue facing shortages. Research by Engineers Australia and others is needed to quantify the scale and detail of the supply and demand mismatch, now and in the future. The results will be used to guide decisions by students, educators, migrants, employers and governments.

3.3 Domestic supply

3.3.1 School to university

International border closures have highlighted the need to maintain an adequate supply of engineers from domestic sources. The jobs of tomorrow are more likely to utilise STEM skills as technological disruption impacts traditionally skilled and unskilled vocations.[10]

The academic development of an engineer is a decade long process. Developing Australia's ability to generate its own engineers begins at school with the creation of an adequate flow of students who have an interest in engineering and studied the subjects providing a firm grounding in science and mathematics by the time they reach year 11 and 12. Increasing this pool of students provides more options when it comes to choosing their higher education pathway.

To be considered at the level of 'professional engineer' requires the completion of a (minimum) four-year undergraduate degree. Data shows currently only 25% of graduates complete an engineering undergraduate in the 'minimum' four-year time. This extends the timeline for the development of 75% of engineering graduates. The number of completions of engineering qualifications has plateaued over the last five years and (assuming a linear relationship for demand of engineering services) has not keep pace with the projected population increase over the next decade (however there is considerable uncertainty around Australia's future population due to the myriad of influences from the pandemic). Developing the academic background of students is important to developing the pipeline but so is developing the students' awareness of career paths and opportunities within the profession.

Increasing take-up of STEM subjects and building awareness of the engineering profession early in a person's education is critical to bolstering the pipeline of upcoming engineers. This requires long term commitment and planning by industry, government and school and tertiary education sectors. Understanding what motivates students to choose engineering is required to support knowing what mechanisms can be employed to improve the pipeline. Engineers Australia is commissioning research to explore the factors surrounding an individual's choice to choose an engineering qualification. This research will inform opportunities for change.

3.3.2 Post graduate workforce

Once an engineer has graduated university it takes five to seven years of experience before an engineer is considered competent for independent practice. Internships, graduate programs and early career employment opportunities are a critical part of an engineer's development to fulfil the current needs of employers for 'experienced' engineers.

Analysis from the 2016 census shows approximately half of all engineering bachelor graduates, if they were working, were not working in engineering occupations. The analysis implies the inability of the profession to retain such a large cohort of qualified engineers is contributing to the shortage of engineering skills. The reasons for why such a large cohort of engineers don't remain in the profession is unknown. Some theories include one of the benefits of undertaking an engineer qualification is the skills it develops are sought after by many employers across a range of

[10] PricewaterhouseCoopers, *A smart move*, (2015) <https://www.pwc.com.au/pdf/a-smart-move-pwc-stem-report-april-2015.pdf> at 26 November 2021.

industries. It may also be the salaries and the prestige associated with working at certain firms are greater outside the engineering profession.[11]

Keeping graduate engineers in the profession needs to be a focus from both government and industry and they should look at ways to support upcoming generations of engineers. Understanding the reasons why so many engineers leave the profession should be made a priority to mitigate against it. Increasing intake of engineering students will not solve this problem. At a starting point retaining the current supply of engineers in the workforce should be the focus.

3.4 Supply via migration

With overseas-born engineers making up so much of Australia's engineering workforce, skilled migration will remain essential to the nation's engineering capability in the short and medium term.

The Government's inclusion of certain engineering occupations on the Priority Migration Skilled Occupation List will assist minimally in the short term, however, longer term thinking is needed to ensure supply.

Migrant engineers in Australia are much more likely than their Australian born counterparts to work in non-engineering roles. The government's migration policy is set to meet the objective of enhancing domestic capability, however, there is still considered to be a shortage of engineers even with a latent supply of overseas-born engineers struggling to find suitable work to their skill and experience level. Continuing large scale intakes of qualified engineers will not significantly develop Australia's engineering capability without significant reform. In particular, better utilisation of the skills currently in Australia (both through migrants and those looking to re-enter the engineering workforce) should be sought in the short term.

Action needs to be taken to modify Australia's migration program to ensure a better fit for the policy objectives with more of a focus on migrant employment outcomes. Research conducted by Engineers Australia highlighted seven barriers to employment for migrant engineers (see Section 4.2.3). These include migrants lacking local knowledge and experience, perceived differences in soft skills and a lack of local references who can attest to their experience. Overcoming these barriers will start to see this cohort return to their vocation.

3.5 Understanding the future

Understanding the future requirements of the engineering profession is critical to planning for sufficient supply of engineers.

The COVID-19 pandemic made predicting the future labour market much harder. More certainty in modelling will be available post-COVID. In addition, a federal election in early 2022 means long-term government priorities may shift.

However, demand for engineers is very unlikely to reduce and without action across the three primary areas of school to university supply, early career development and retention, and efficient utilisation of migrants, we are likely to continue facing shortages.

The Government's inclusion of certain engineering occupations on the Priority Migration Skilled Occupation List will assist minimally in the short term, however, longer term thinking is needed to ensure supply.

Research by Engineers Australia and others is needed to quantify the scale and detail of the supply and demand mismatch, now and in the future. The results can be used to guide decisions by students, educators, migrants, employers and governments. Furthermore, governments and industry need to avoid boom-bust cycles which lead to a unsustainable bubbles in certain skills' demand and supply and create employment uncertainty and a disincentive for prospective engineering students and the loss of experienced engineers from the profession.

[11] Julie Hare, *Guess who earns the big bucks?* Australian Financial Review <https://www.afr.com/work-and-careers/education/guess-who-earns-the-big-bucks-20211105-p596c8> at 26 November 2021.

4. Profile of the migrant engineering labour force

4.1 Where migrant engineers come from and their destinations

The data used in this chapter, like the rest of the submission, is mostly based on the 2016 census. Although this means the data is dated and so the results would be different today, Engineers Australia believes that the scale of the variances between Australian-born and overseas-born engineers would remain. The 2016 census data is, therefore, a very valuable indicator of the trends and the scale of the issues.

In 2006, the majority of qualified engineers were Australian-born. By 2016, 58.5% were born overseas, with only 41.5% born in Australia. This increase was mostly due to skilled migration. Skilled migration has substantially affected the ethnic composition of the engineering labour force to a greater degree than in other skilled professions. At the 2016 census, 30.2% of the general population was born overseas.[12]

At the 2016 census, there were 192,899 overseas-born engineers in the Australian labour force. A further 52,924 were not in the labour force or did not state their status. Of those in the labour force:

- 161,402 (83.7%) were men, and 31,497 (16.3%) were women.
- 78,981 (40.9%) were employed in engineering occupations.

4.1.1 Source countries

The composition of the source of Australia's overseas-born qualified engineers has shifted over time. In the most recent arrival period, India, China and the Philippines account for 43.5% of new migrant engineers. Table 1 demonstrates the change in source for overseas-born qualified engineers in the Australian labour force.

Of those who arrived before 1990, England supplied the most with 5,483 and the top 10 nations supplied just over half of all overseas-born qualified engineers. Of those who arrived from 2007 onwards to the time of the 2016 census, the top supplier was India which supplied 23,217 and the top 10 nations supplied two-thirds of all migrant engineers (so, the supply source was more concentrated).

Table 1 Top 10 source countries for overseas-born qualified engineers

Rank	Before 1990	Number	Since 2007	Number
1	England	5,483	India	23,217
2	Vietnam	2,494	China	9,594
3	China	2,421	Philippines	6,950
4	New Zealand	1,754	England	4,682
5	Malaysia	1,699	Iran	4,570
6	Philippines	1,482	Malaysia	2,707
7	India	1,080	Sri Lanka	2,762
8	Sri Lanka	1,062	South Africa	2,672
9	Poland	958	Pakistan	2,451

[12] Australian Bureau of Statistics, 2016 Census QuickStats, <https://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/036> at 12 March 2021.

Rank	Before 1990	Number	Since 2007	Number
10	Hong Kong	946	Bangladesh	1,805
	Top 10	19,379	Top 10	61,410
	All arrivals	34,360	All arrivals	91,515
	% top 10	56.4%	% top 10	67.1%

4.1.2 Industries of employment

In Appendix A the concept of 'core industry' is explained. Migrant engineers are much more likely than Australian-born engineers to work in non-core industries, which indicates that they are also much more likely to work in non-engineering roles. This trend is true of migrants regardless of arrival date and is most pronounced for recent arrivals.

For example, 69.6% of Australian-born engineers work in core industries, but just 56.5% of all migrants do, and this reduces even further to 48.9% for those who arrived since 2012. Looked at differently, in the core industries, 52.3% of the engineers were overseas-born, compared to 65.8% in non-core industries.

The concern is that migrant engineers are arriving in Australia to meet a policy objective of enhancing domestic engineering capability, but we are only making effective use of 40.9% of them (that being the proportion who work in engineering roles). For example:

- In the retail industry, the biggest employer of engineers is the supermarket and grocery stores sector. In 2016, over 1,100 migrant engineers who arrived in Australia after 2011 worked in this subindustry, but only 4.9% were employed in engineering occupations.
- Similarly, over 2,600 migrant engineers who arrived in Australia after 2011 worked in the cafes, restaurants and takeaway food industry – a sub-industry of the accommodation and food services industry. Of those, only 1.1% worked in engineering occupations.
- And for administrative and support services, the largest sub-industry is building cleaning, pest control and garden services, which employed over 1,200 migrant engineers who arrived after 2011. Only 1.7% of these engineers worked in engineering occupations.

4.1.3 Location of employment

At the 2016 census, the lion's share (an average of 63.6% across all arrival cohorts) of skilled migration of qualified engineers was in NSW and Victoria.

The resources boom did attract migrant qualified engineers away from NSW and Victoria, mainly to Queensland and Western Australia. However, the changes involved were relatively small compared to the overall intake of migrant qualified engineers.

Engineers are more likely than other skilled workers to be in capital cities (see Appendix A for details). For example, in NSW, 80.4% of the engineering labour force was in Sydney, compared to 74.9% of other skilled workers. If Australian and overseas-born engineers are considered separately, it is observed that in NSW, for example, 66.7% of Australian-born qualified engineers are in Sydney, compared to 91.5% of migrant qualified engineers. That pattern is replicated for each jurisdiction.

4.2 Employment outcomes for migrants

The difference in employment outcome for migrants as compared to Australian-born engineers is significantly worse, both in terms of utilisation in engineering roles and raw unemployment, especially for women and those in regional capitals.

Labour force participation in 2016 for overseas-born qualified engineers who arrived from 2012 onward has fallen well below rates for both other arrival cohorts and for Australian-born qualified engineers. Irrespective of when they

arrived, overseas-born engineers experience higher unemployment rates than Australian-born engineers do, with recent arrivals experiencing higher rates than in the unskilled labour force segment.

These figures suggest that continuing large scale intakes of qualified engineers will not significantly develop Australia's engineering capability, unless if action is taken to modify the migration program to ensure a better fit for the policy objectives, and more support is provided to migrants and employers to ensure better employment outcomes.

4.2.1 Unemployment rate

At the time of the 2016 census, the unemployment rate for engineers generally was 6.0%, and when broken down by gender was 5.5% for men and 9.1% for women.

If Australian-born engineers are considered in isolation, the rate is 3.7%. When split for gender, it is quite similar, with 3.7% for men and 3.8% for women.

However, the situation for migrants is put into stark relief if overseas-born engineers are examined in isolation. The numbers change to an overall rate of 7.6%; 6.9% for men and 11.3% for women. For women there is, on average, a 7.5 percentage point difference if one's country of origin is not Australia.

Employment outcomes for migrants who have been settled in Australia for a long time are generally better than the overall average for migrants, but still do not meet the same benchmark for engineers as a whole.

The unemployment rate also differs markedly for migrants depending on where they come from, and where they live in Australia.

Unemployment by country of origin

In Figure 1 on the following page, the grey line at 3.7% is the unemployment rate for Australian-born engineers in the labour force at the 2016 census. This is then compared to the unemployment rate in 2016 for qualified engineers from the top 10 source countries who arrived in Australia between 2007 and 2016.

It shows that all migrant groups examined (which at Section 4.1.1 we explained deliver 67.1% of all migrant engineers) have higher rates of unemployment than Australian-born engineers. For those from India, China, Iran, Malaysia, Pakistan and Bangladesh, the differences are stark.

The only source countries that come within one percentage point of the Australian-born rate are England and South Africa. For an Iranian engineer (noting that Iran is currently the fifth largest source of engineers) there is, on average, a 10.7 percentage point difference in unemployment rate when compared to an Australian-born engineer.

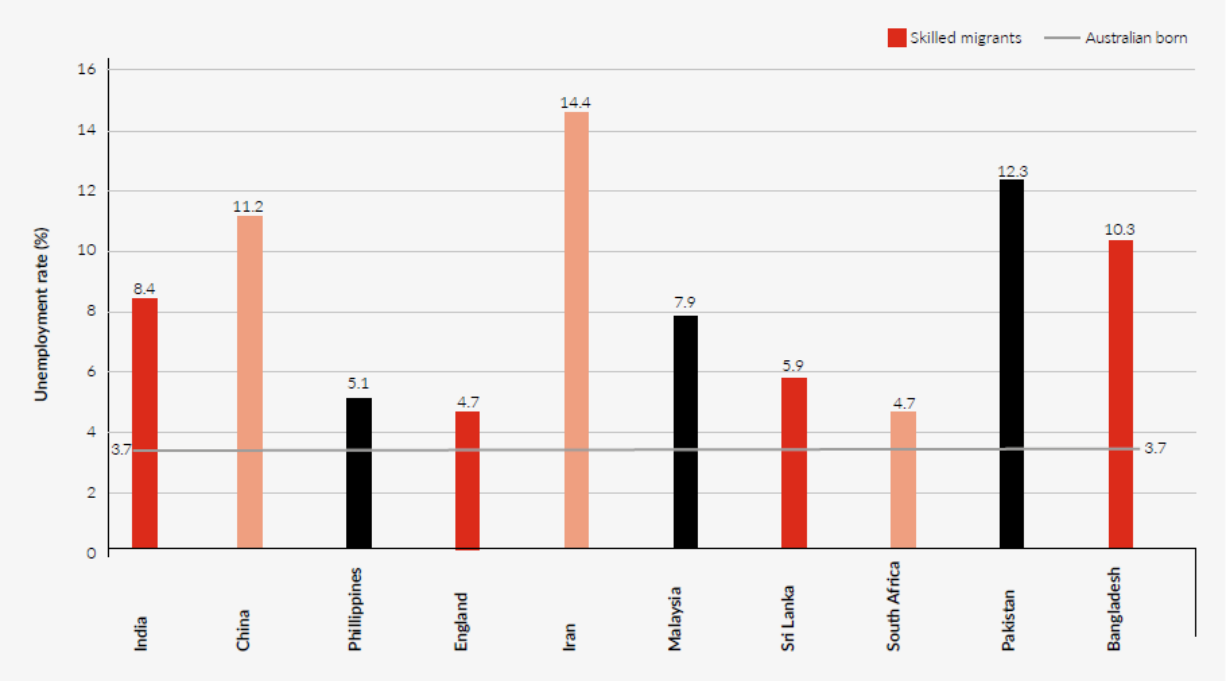


Figure 1

Unemployment by date of arrival and city of settlement

Noting that, at the 2016 census, the overall unemployment rate for Australian-born engineers was 3.7%, and for overseas-born engineers it was 7.6%, Figure 2 on the following page shows the unemployment rate for migrant engineers in each capital city (except Canberra). It demonstrates that employment outcomes are much worse for recent arrivals. Darwin is an outlier, probably because at the time of the census there was high demand for engineers in the Northern Territory. Also, Hobart shows a low unemployment rate for older arrivals, but an enormous disparity with the employment outcomes of recent arrivals.

This data suggests that attempts to use the skilled migration program to boost employment and productivity in regional Australia is, to a significant extent, failing. Also, that the opportunity to boost domestic engineering capability with new migrants is inefficient—it takes too long to get new migrants into employment.

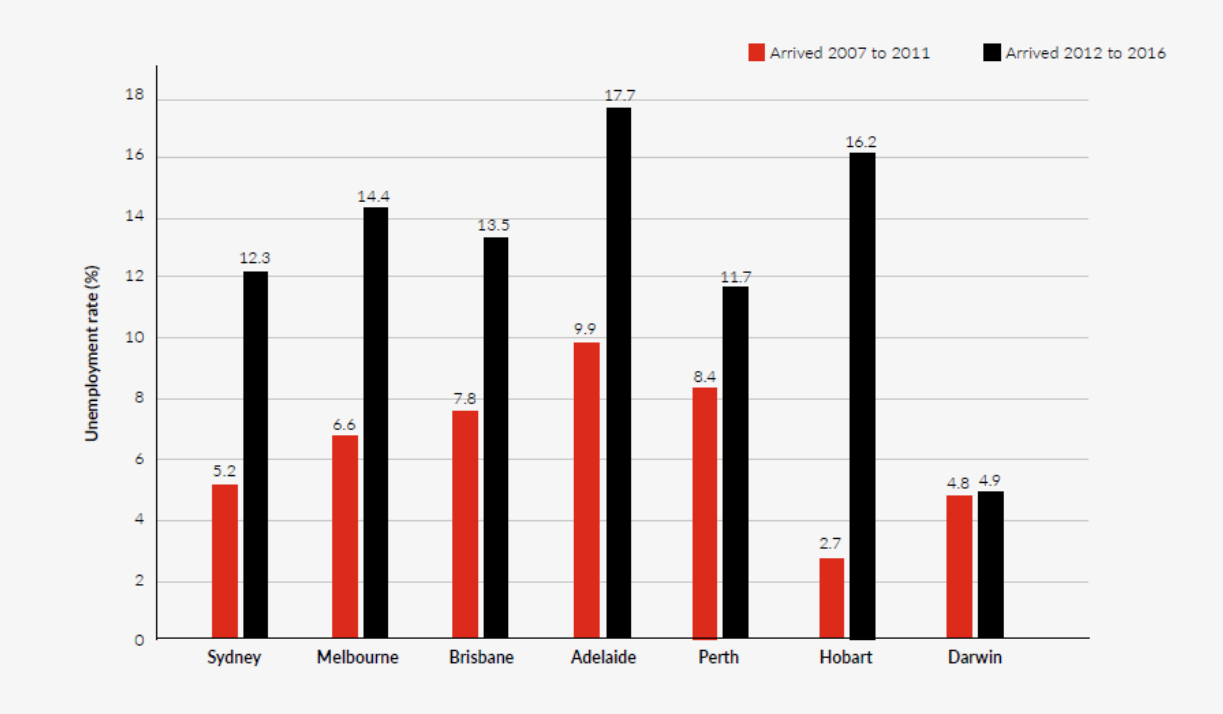


Figure 2

4.2.2 Employment in engineering occupations

In Figure 3, below, the black line represents the percentage of engineers working in an engineering role in 2016 (the Y-axis in the original report form which this came was mislabelled as 'unemployment'). At section 4.2.1 it was shown that the unemployment rate for migrant engineers is higher than for engineers generally. Only those from England and South Africa enjoyed an unemployment rate approaching that of the Australian-born.

Figure 3 demonstrates that those same groups of migrant engineers who are employed, are much less likely than Australian-born engineers to work in engineering roles—again, except for those from England and South Africa.

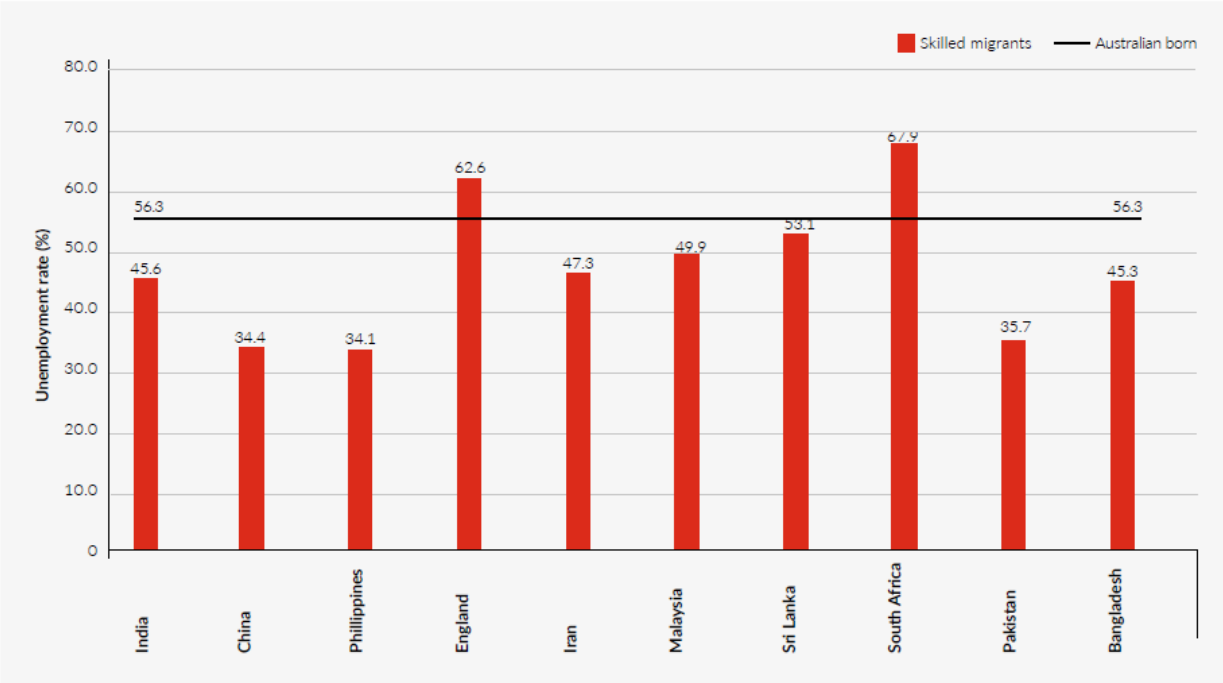


Figure 3

4.2.3 Understanding why migrant engineers have poor employment outcomes

There is very little hard evidence to explain the reasons for the employment outcomes of migrant engineers described above.

A recent survey conducted by the University of Technology, Sydney (UTS) into employment barriers for skilled migrant engineers identified the following as the potential top three barriers to employment for migrants:

- Lack of local experience
- Lack of local references
- Not a permanent visa holder or citizen

The same research identified some key solutions to employment, these being:

- Internship opportunities
- Mentoring programs
- Re-skilling/upskilling

Each of these factors can be addressed. For example, language entrance requirements could be raised, or training provided once onshore; local experience is earned as soon as employment commences; and engineers are trained to read and understand new standards as a normal part of their career, with specific standards typically learned after graduation.

Other viable programs include government supported internships, and industry run mentoring and networking programs to enhance local experience, knowledge and networks that contribute to employment outcomes for skilled migrant engineers.

The barriers to employment can be overcome with relatively simple effort on the collective part of government, industry and the migrants themselves. Since these barriers remain, it indicates that the issues may run deeper.

New research data available

To fully understand these barriers to employment, from the migrants' experience and from those of employers and recruiters, Engineers Australia recently completed a research project to uncover these barriers from both perspectives. Without proper research, the feedback from employers and migrants is, to date, anecdotal.

Engineers Australia's research project addressed two main areas for understanding the barriers to employment for overseas-born engineers.

1. Understanding the lived experience of engineers born overseas (both skilled migrants and those with humanitarian refugee status), the barriers they face, the mental, societal, and financial impact on them, and the economic impacts.
2. The barriers within industry and recruiting firms to employing overseas-born engineers.

This work addressed factors like the length of time it takes for skilled migrants to gain employment, the underutilisation of their skills (underemployment), and the fact that overseas born female engineers have almost three times the unemployment rate of Australian born female engineers, just to name a few. It looked in depth at the employment side of the equation to identify what industry employers and recruiters are looking for, where they see the gaps in overseas born versus Australian born candidates and what can be done to address those gaps.

Now that these barriers are understood through our qualitative research, it is available to inform collaborative work with government, industry and academia to co-design solutions to employment outcomes.

The research identified seven barriers that employers and recruiters perceive to hiring overseas-born engineers. These range from a lack of local knowledge and experience to perceived differences in soft skills, and a lack of local people who can 'vouch' for these engineers. On a more individual level, barriers also encompass visa or sponsorship working rights issues, and concerns regarding international certification validity and perceived 'flight risks'.

The seven specific barriers to hiring migrant engineers that must be addressed are as follows:

1. A lack of local knowledge and experience
2. Perceived cultural differences in soft skills
3. Visa or sponsorship working rights issues
4. A lack of people who can 'vouch' for them locally
5. Certification queries
6. 'Flight risk' concerns
7. Tendency to hire 'networks' at senior-level roles

Based on the research results contained in our report, *Barriers to employment for migrant engineers*, Engineers Australia sees six key opportunities to address these barriers:

1. Positioning migrant engineers as a collective talent pool and talking to the size of the opportunity for employers
2. Providing credible, trusted information on employment pathways for migrant engineers
3. Increasing local networks by developing networking and sponsorship programs/opportunities for migrant engineers
4. Coordinating initiatives to build local knowledge and experience of migrant engineers
5. Assisting humanitarian visa holders with their credentials assessment
6. 'Making it easy' for employers to access the talent pool.

The report, *Barriers to employment for migrant* engineers, is available online at https://engineersaustralia.org.au/sites/default/files/resource-files/2021-10/barriers-employment-migrant-engineers.pdf.

5. Responses to consultation questions

5.1 Primary questions

5.1.1 Should the Australian Government increase/reduce/maintain the size of the Migration Program in 2022-23 and why?

Engineers Australia does not have a fixed opinion on how large the migration program should be.

Engineers Australia recommends that:

- All engineering occupations should be included on migration skills lists.
- More support should be provided to migrants and employers to help ensure their employment outcomes are as good as Australian-born workers.
    - This is especially important for those who arrive via the following pathways: Skilled independent, State/territory nominated, Regional.
    - It is also essential to apply a focus on women because overseas born female engineers have almost three times the unemployment rate of Australian born female engineers.

The size of the migration program should also be informed by robust studies of skills demand. This is an issue that was identified by the Australian Parliament's Joint Standing Committee on Migration in its Final Report of the Inquiry into Australia's Skilled Migration Program:[13]

> *The Committee recommends that building on the work of the National Skills Commission (NSC) and the Skilled Migration Officials Group, the Federal Government develop a dynamic national workforce plan. The plan would co-ordinate the efforts of State and Federal Governments to ensure Australia's persistent skills shortages and future workforce needs are addressed through Australia's higher education and vocational education systems, employment services and the skilled migration program. This plan should be regularly updated. In order to develop the plan:*
>
> - *A cross-portfolio, cross-jurisdictional interagency committee (IAC) should be established, meet regularly, and comprise decision-makers from departments and agencies, led by the NSC.*
> - *The NSC and relevant data collection bodies should also develop a data aggregation system that identifies skills shortages at a regional level by occupation.*

Engineers Australia recommends that Recommendation 1 of the Australian Parliament's Joint Standing Committee's Final Report of the Inquiry into Australia's Skilled Migration Program be accepted by Government and implemented.

5.1.2 What is the ideal composition of the Skill and Family streams of the 2022-23 Migration Program?

Engineers Australia does not have a fixed opinion on the ideal composition of the Skill and Family streams. However, there are several factors that should be considered to inform how applicants are selected.

Employer sponsored versus independent pathways

[13] Joint Standing Committee on Migration *Final Report of the Inquiry into Australia's Skilled Migration Program* (2021) Parliament of the Commonwealth of Australia <https://www.aph.gov.au/Parliamentary_Business/Committees/Joint/Migration/SkilledMigrationProgram/Report_2> at 26 November 2021.

In general terms, data available to Engineers Australia indicates that employer-sponsored visas (either temporary or permanent) are the most efficient option to fill immediate job vacancies. The other pathways that are not linked to specific jobs, in contrast, are useful mainly for lifting overall engineering capability of the Australian population.

It is important to remember that the skilled migration program is mostly about the future needs of Australia, rather than immediate short term specific labour market status and job vacancies (for which the employer-sponsored scheme is more appropriate). Therefore, all engineering occupations should remain on skills lists due to the increasing diversity of engineering practice, and increased cross-disciplinary nature of engineering work.

ANZSCO codes and the skills lists

An area of concern is that, for engineering, there would be benefit in reviewing the basis for the skills lists to better accommodate future needs. The skills lists are based on Australian and New Zealand Standard Classification of Occupations (ANZSCO) codes and these are typically for the traditional disciplines of engineering and role titles (e.g. draftsperson).

Greater alignment between Fields of Education, Fields of Research and ANZSCO would enable greater data interrogation. The data reported in Appendix B is based on Fields of Education. This misalignment has resulted in some unintended consequences. For example, Electrical Engineering and Electronics Engineers are treated as separate occupation categories but are often taught within a combined program. Differentiating graduates with different quotas can be challenging.

Engineering is an evolving profession and, if Australia is to enable migration of those with skills in emerging fields of practice and emerging industries, the skills lists need to be more amenable to change.

The need for a mechanism to supersede, or at least improve, ANZSCO was identified by the Australian Joint Standing Committee on Migration in its Final Report of the Inquiry into Australia's Skilled Migration Program.[14] Recommendation 2 of the committee is supported by Engineers Australia:

> *The National Skills Commission should develop a new occupation and/or skills identification system for the skilled migration program in consultation with industry to replace ANZSCO. The new system should be more flexible to adapt to emerging labour market needs, with consideration given to how the new system would integrate with other functions of government currently utilising the ANZSCO.*

Engineers Australia recommends that Recommendation 2 of the Australian Parliament's Joint Standing Committee Final Report of the Inquiry into Australia's Skilled Migration Program be accepted by Government and implemented.

Points system

An element of the skilled migration program that needs reform is the points-based system for ranking applicants. Engineers Australia is concerned that it skews supply towards those with relatively low levels of work experience.

The points-based system can generate many combinations of outcome that skew results (as is intended) but not always towards outcomes that are likely to lead to employment outcomes that match the potential of the migrant.

For example, on the basis of age, a 20-year-old (with presumably no work experience as an engineer) earns 25 points, in contrast to a 40-year-old (with probably 15 years of experience) earning 15, and anyone over 45 earning none.

The age-based points are partially offset by the skilled employment points favouring someone with 15 years of experience. However. This is complicated if you consider that an engineer is not eligible for registration (and thus independent practice) until they have accrued five years of relevant experience. So, a 25-year-old with some work experience but not enough to practice independently (assume graduation at a typical age of 21) will earn a total of 35 points, in contrast to a 40-year-old who will earn 30.

[14] Joint Standing Committee on Migration *Final Report of the Inquiry into Australia's Skilled Migration Program* (2021) Parliament of the Commonwealth of Australia <https://www.aph.gov.au/Parliamentary_Business/Committees/Joint/Migration/SkilledMigrationProgram/Report_2 > at 26 November 2021.

Another example of the points system devaluing experience is the English test results. For example, a new overseas graduate will earn 10 additional points if they achieve Proficient English (7 in each band in IELTS) or 20 additional points if Superior English is achieved (8 in each ban in IELTS). By contrast, eight years of overseas work experience provides only 15 additional points.

Some visa classes enable migration if the applicant agrees to remain in a regional location for two to four years. The obligation to remain in the area can however pose a significant barrier to finding jobs that match the migrant's skills and experience.

The points-based system can generate many combinations of outcome that skew results (as is intended) but not always towards outcomes that are likely to lead to employment outcomes that match the potential of the migrant. For example, an applicant for the Skilled Work Regional (Provisional) visa (subclass 491) will earn an extra 15 points if being sponsored by a family member and the Minister has accepted that sponsorship. Unfortunately, as shown at Section 4.2.1 of this submission, employment outcomes for regional cities are often much worse for engineers.

Engineers Australia recommends that the points-based system be reviewed to ensure it does not create unintended consequences in the supply of migrants or their employment outcomes onshore.

5.1.3 How can Australia remain attractive to prospective migrants to support our recovery from the impacts of COVID-19 in the short term and support a future Australia for 2030 and beyond?

The Department of Home Affairs Discussion paper notes at page 3, "*Internationally, there is fierce competition for global talent. The OECD Indicator of Talent Attractiveness of 2019 rated Australia as the most attractive OECD country for highly qualified workers. However our attractiveness for entrepreneurs ranked seventh, behind Canada, Switzerland, New Zealand, Sweden, Germany and Norway.*"

A significant risk to Australia's attractiveness is the high likelihood that a migrant engineer will have very poor employment outcomes when compared to their Australian-born peers, especially if they come from the primary source countries of China, India and other significant source countries like Iran, Malaysia, Pakistan and Bangladesh. The evidence for this is provided at Section 4.

The reasons for the poor outcomes are emerging through research, as described at Section 4.2.3. The options to improve the situation are relatively clear and achievable if given the appropriate attention by government, and in partnership with employers:

1. Position migrant engineers as a collective talent pool and talk to the size of the opportunity for employers
2. Provide credible, trusted information on employment pathways for migrant engineers
3. Increase local networks by developing networking and sponsorship programs/opportunities for migrant engineers
4. Coordinate initiatives to build local knowledge and experience of migrant engineers
5. Assist humanitarian visa holders with their credentials assessment
6. 'Make it easy' for employers to access the talent pool.

5.2 Supplementary questions

5.2.1 How can the Skill stream of the Migration Program effectively address workforce shortages while boosting efforts to upskill and reskill Australians?

This submission has demonstrated that the migration program, with regard to engineers, is inefficient. Also, the department has recognised that there is fierce competition for global talent. Relying on skilled migration to resolve workforce shortages would be a very high-risk approach.

Instead, concurrent action needs to be taken to improve domestic supply of engineers. There are two primary areas that demand action:

- significant investment in young people, and the support they need to consider and succeed in further studies and a career in engineering.
- industry-led development of early career graduates.

The migration program may have a role to play in those two issues. Examples include exploring initiatives such as:

- Prioritising migration for primary and high school teachers with specialist maths and science teaching skills.
- Consider amendment of labour market testing requirements to also require sponsors to have an agreed ratio or number of undergraduate, graduate and early career positions established (and filled) in the company. This may help ensure that employers are investing in the next generation of worker instead of relying on skilled migration as the primary source of experienced workers.

5.2.2 How can the Migration Program help address the challenge of uneven population growth and economic development between urban and regional Australia?

Some visa classes enable migration if the applicant agrees to remain in a regional location for two to four years. The intention of this policy is to attract migrants to those areas. The obligation to remain in the area can however pose a significant barrier to finding jobs that match the migrant's skills and experience. For engineers this is because the great majority of engineering roles are in metropolitan areas, especially Sydney and Melbourne.

That an engineer migrant is locked into living in an area with fewer suitable roles could be another reason for why the unemployment rate for migrants in regional capitals is usually high. See Section 4.2.1 for details of unemployment rates in regional capitals.

It is recommended that the regional sponsorship program be reviewed, and consideration given to freeing migrants of their obligation to remain in the regional area after a shorter period of time, such as six months.

5.2.3 How can migration policy settings better support economic security of women in Australia overall, and migrant women in particular?

As introduced at Section 4.2.1, at the time of the 2016 census, the unemployment rate for engineers generally was 6.0%, and when broken down by gender was 5.5% for men and 9.1% for women. If Australian-born engineers are considered in isolation, the rate is 3.7%. When split for gender, it is quite similar, with 3.7% for men and 3.8% for women.

However, the situation for migrants is put into stark relief if overseas-born engineers are examined in isolation. The numbers change to an overall rate of 7.6%; 6.9% for men and 11.3% for women. For women there is, on average, a 7.5 percentage point difference if one's country of origin is not Australia.

As mentioned at Section 5.1.1, more support should be provided to migrants and employers to help ensure their employment outcomes are as good as Australian-born workers. It is essential to apply a focus on women because, as the data at Section 4.2.1 shows, female migrants have worse employment outcomes than both migrant men, and Australian born men and women.

5.2.4 How can migration policy settings better support social cohesion outcomes in Australia?

When compared to Australian-born engineers, the disparity in employment outcomes for migrants generally, and especially migrant women, are a significant risk to social cohesion. The issues have been described in detail at Section 4, including a range of practical solutions. This has been reinforced via our response to the Discussion Paper questions relating to making Australia an attractive destination for migrants.

Appendix A: Engineering workforce

In this submission, "engineer" refers to engineering associates, engineering technologists and professional engineers. "Professional engineer" is the most numerous and what people usually think about when describing an engineer, but each is vital to a well-functioning engineering profession. Their attributes are:

1. **Professional Engineer**: Professional Engineers apply lifelong learning, critical perception and engineering judgement to the performance of engineering services. They challenge current thinking and conceptualise alternative approaches, often engaging in research and development of new engineering principles, technologies and materials. Professional Engineers require at least the equivalent of the competencies in a four-year full-time honours bachelor degree in engineering.

2. **Engineering Technologist**: Engineering Technologists exercise ingenuity, originality and understanding in adapting and applying technologies, developing related new technologies or applying scientific knowledge within their specialised environment. Engineering Technologists require at least the equivalent of the competencies in a three-year full-time bachelor degree in engineering.

3. **Engineering Associate**: Engineering Associates apply detailed knowledge of standards and codes of practice to selecting, specifying, installing, commissioning, monitoring, maintaining, repairing and modifying complex assets such as structures, plant, equipment, components and systems. Engineering Associates require at least the equivalent of the competencies in a two-year full-time associate degree in engineering or a two-year full-time advanced diploma in engineering from a university or TAFE college.

The following illustrates the scale of each cohort of engineer: cumulatively from 2010 to 2018, Australian universities have produced about 69,030 new domestic graduates (that is, not overseas students) eligible to join the engineering team: 4,279 engineering associates (6.2%); 4,800 engineering technologists (7.0%) and 59,951 professional engineers (68.8%). (Note that the number of engineering associates supplied via TAFE qualifications is not included due to an unavailability of relevant statistics to Engineers Australia.)

Basic characteristics of engineers in Australia

At the 2016 census, there were 329,957 engineers in the Australian labour force. A further 87,621 were not in the labour force or did not state their status. Of those in the labour force:

- 284,975 (86.4%) were men, and 44,982 (13.6%) were women.
- 185,916 (56.3%) were employed in engineering occupations.

Industries of employment

Engineers feature much more prominently in a select number of industries, which are classified by Engineers Australia as "core industries." The remaining industries are classified as non-core. The core industries have both a high number of engineers and a high proportion of those engineers working in actual engineering occupations. They are:

- Professional, Scientific and Technical Services
- Mining
- Electricity, Gas, Water and Waste Services
- Information Media and Telecommunications
- Construction
- Public Administration and Safety
- Manufacturing

The top 10 industries of overall employment are as follows, noting this list has broken the classification down to the next, more granular, level of ABS industry classification:

1. Architectural, Engineering and Technical Services
2. Computer System Design and Related Services
3. Tertiary Education

4. Heavy and Civil Engineering Construction
5. Telecommunications Services
6. Metal Ore Mining
7. Other Machinery and Equipment Wholesaling
8. Defence
9. Cafes, Restaurants and Takeaway Food Services
10. Local Government Administration

Location of employment

In almost all states, concentrations of both qualified engineers and engineers employed in engineering occupations are disproportionately higher in capital city regions than in other regions within the state.

Concentration of skilled workers in capital cities is not unique to qualified engineers, but a feature of all skilled workers. However, except for Hobart, the concentration of qualified engineers in capitals is higher than for other skills.

At the time of the 2016 census, the percentage of the engineering labour force in each jurisdiction was as follows:

- NSW: 32.7%
- Victoria: 28.0%
- Queensland: 16.3%
- Western Australia: 13.8%
- South Australia: 5.5%
- Australian Capital Territory: 1.8%
- Tasmania: 1.0%
- Northern Territory: 0.9%

Appendix B: Supply of engineers

Skilled migrants are essential to Australian engineering capability. At the time of the 2016 census, 58.5% of all engineers in the Australian labour force were born overseas.

Australia sources its engineering labour force from national engineering education programs and from permanent and temporary skilled migration programs. At present the structural balance is weighted in favour of overseas born engineers which presents risks if migration factors change adversely—such as a global pandemic with associated closure of international borders.

The source of new engineers in 2015 (the date for which data for all three groups is available to Engineers Australia), was as follows:

- Entry level graduates: 8,162 (in 2018 the number was 8,444)
- Permanent visa holders: 10,778
- Temporary visa holders: 5,709

Supply is influenced by government higher education and migration policies, and by the choices made by individuals to study engineering. Therefore, it is important that Australia continues to increase the production of its own engineers through its education system.

Detail on supply from migration programs is provided at Section 4. The following is an examination of domestic supply through universities.

Domestic students

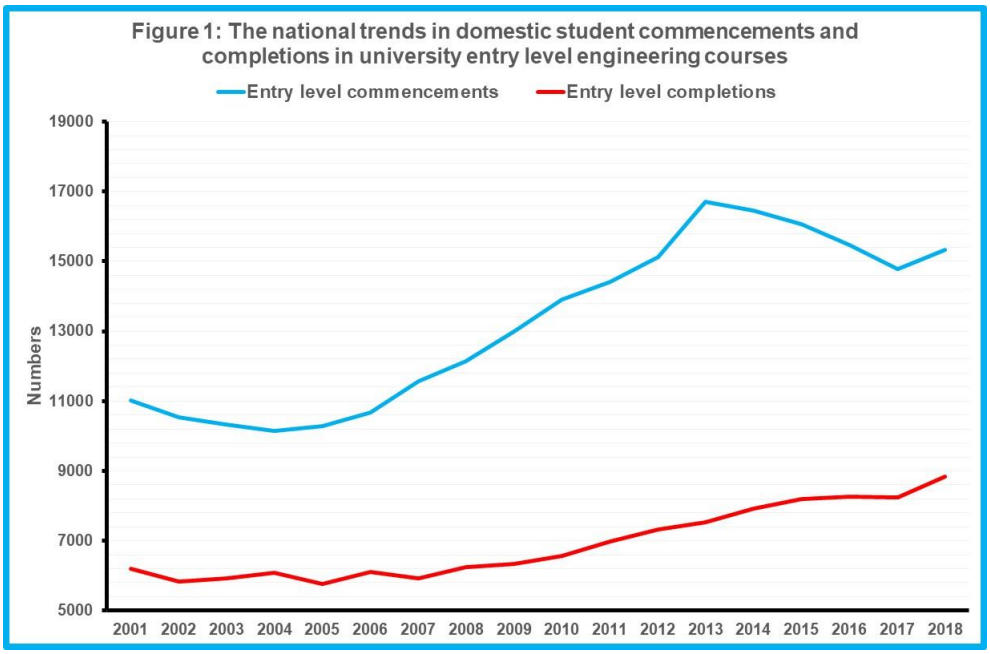
Domestic students are citizens and permanent residents and production of engineers from this group demonstrates progress toward mitigating the risks associated with high dependence on skilled migration.

The following table (copied from the Engineers Australia report, *Australia's Next Generation of Engineers: university statistics for engineering*) shows the number of domestic entry-level completions from Australian universities from 2003-2018. A range of data can be derived from the table, but the overall point is that there is currently about 8-8,500 domestic entry-level completions each year.

Table 15: Additional Supply of Engineers from Domestic University Course Completions in Engineering

Source	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Men																
Associate Engineers	90	92	87	83	121	155	254	285	300	475	437	445	515	488	457	493
Engineering Technologists	524	488	561	691	490	502	439	346	377	419	400	488	415	465	455	486
Professional Engineers																
Four year degree	3272	3302	3310	3179	3417	3648	3653	3626	3945	4061	4186	4279	4437	4598	4436	4625
Four year double degree	1051	1215	1195	1192	1165	1082	1069	1348	1324	1355	1519	1562	1629	1292	1432	1604
Sub-total	4323	4517	4505	4371	4582	4730	4722	4974	5269	5416	5705	5841	6066	5890	5868	6229
Total completions	4937	5097	5153	5145	5193	5387	5415	5605	5946	6310	6542	6774	6996	6843	6780	7208
Women																
Associate Engineers	14	<10	<10	<10	12	20	24	35	27	40	35	58	50	55	36	48
Engineering Technologists	88	88	139	156	109	130	116	117	117	99	112	155	82	85	90	92
Professional Engineers																
Four year degree	663	636	604	528	506	523	552	542	595	624	627	659	641	705	696	734
Four year double degree	233	251	275	280	274	247	234	258	297	311	311	349	393	269	320	362
Sub-total	896	887	879	808	780	770	786	800	892	935	938	1008	1034	974	1016	1096
Engineering Team	998	975	1018	964	901	920	926	952	1036	1074	1085	1221	1166	1114	1142	1236
Total																
Associate Engineers	104	92	87	83	133	175	278	320	327	515	472	503	565	543	493	541
Engineering Technologists	612	576	700	847	599	632	555	463	494	518	512	643	497	550	545	578
Professional Engineers																
Four year degree	3935	3938	3914	3707	3923	4171	4205	4168	4540	4685	4813	4938	5078	5303	5132	5359
Four year double degree	1284	1466	1470	1472	1439	1329	1303	1606	1621	1666	1830	1911	2022	1561	1752	1966
Sub-total	5219	5404	5384	5179	5362	5500	5508	5774	6161	6351	6643	6849	7100	6864	6884	7325
Engineering Team	5935	6072	6171	6109	6094	6307	6341	6557	6982	7384	7627	7995	8162	7957	7922	8444

The following figure, copied from the same Engineers Australia report, shows the quite variable trend in the number of domestic students choosing to study engineering, and consequently completing qualifications. The quite worrying downward trend from 2013-2017 appears to have reversed, but it highlights the degree to which Australian engineering capability is dependent on an effective skilled migration program.



Overseas students in context

Overseas students are those studying in Australia under temporary visa arrangements related to their education. There were 4,850 completions of entry level courses by overseas students in 2018. In that same year, there were 7,509 completions of post-graduate courses by overseas students; often mature age students who would exhibit the sorts of attributes sought by employers such as significant prior work experience.

The COVID-19 border restrictions that have led to very low numbers of new overseas fee-paying students at universities influences overall engineering skills supply to some degree, but that is not the whole story.

Some overseas students, when they complete their engineering education, seek to join the Australian engineering labour force. This is possible but only by negotiating skilled migration arrangements such as the *Temporary Graduate visa (subclass 485)* or securing a sponsored work visa.

This group should not be amalgamated with domestic students to establish the supply of new entry level engineers because immigration formalities are the hallmark of this process and many other overseas students do return to their home country. The approach taken by Engineers Australia is to present statistics for overseas students as indicators of what is happening in Australian engineering education, but to capture the increase in supply of entry level engineers through immigration statistics which also capture migrant engineers who did not study in Australia.

In the main, overseas students studying engineering in Australia are part of one of Australia's largest export industries: the export of education services. In 2019, it was reported that international education contributed $37.6 billion to the Australian economy[15]. For engineering programs anecdotal evidence suggests that program choice for international students is directly related to migration opportunity.

[15] The Hon Dan Tehan MP, Minister for Education, 'International education makes significant economic contribution' {Press Release, 22 November 2019) https://ministers.dese.gov.au/tehan/international-education-makes-significant-economic-contribution?utm_source=miragenews&utm_medium=miragenews&utm_campaign=news at 29 March 2021.

Value of overseas students to overall skills pipeline

Many entry-level graduates do go on to work in Australia, but it needs to be noted that, for the purposes of Engineers Australia's analysis, this cohort of engineers should be counted as migrants, and not simply graduates.

Comprehensive data on employment outcomes for graduates overall (domestic and overseas students) is encouraging. For example, in 2020 the share of engineering undergraduates securing full time employment within four months of graduation was 83%, well above the equivalent rate of 69% for all fields of education combined.[16] This data does not show the differences for domestic and overseas graduates of engineering and, for reasons shared with migrants generally and explained at Section 4, it is reasonable to expect that overseas graduates might find it harder than domestic graduates to secure an engineering job.

Research dating back to 2006[17] distilled three reasons for the poor labour market outcomes of overseas graduates of Australian higher education programs of engineering (and accounting and Information Technology (IT)): a lack of occupation specific work experience, an absence of a viable Australian labour market bridging program, and weak English skills.

In 2009, Engineers Australia commenced delivery of a Professional Year Program for Engineering (PY Engineering) through its subsidiary company, Engineering Education Australia (EEA). [18] The Professional Year numbers are significant with 1,350 students in 2019 and 1,450 in 2020.

PY Engineering is a 44-week work readiness program for former overseas engineering students who have graduated from a university within Australia and are seeking permanent residency. Upon successful completion, candidates are eligible to apply for five migration points that can be used for all points tested visas. The program is designed to enhance participants' ability to obtain employment in their chosen discipline by applying their technical skills and knowledge in the Australian workplace.

The first 32 weeks consist of online study and classroom workshops, followed by 12 weeks of work placement in an engineering role. During this time candidates develop a thorough understanding of Australian work conditions, health and safety requirements, and other important aspects of working as an engineer in Australia.

Since 2017, EEA (in collaboration with the professional bodies for accounting and IT) have monitored the destinations of a sample of candidates who have completed the program. The data collected for the first three quarters of 2020 was that between 78% and 83% had secured employment upon completion of the program.

A smaller share of surveyed candidates indicated that they were working in engineering roles. The range in the first three quarters of 2020 was 43% to 61% within six months of completing their program. It is important to note that a large majority of survey participants also indicated that the COVID-19 pandemic had affected their employment (between 59% and 74%). This is significant as in previous years the number of Professional Year students gaining an engineering role has been up to 70% in the six months after the program. Comparative data is not available for all engineering graduates.

These employment outcomes show that by addressing overseas graduates' readiness for the Australian workplace, much of the disparity between employment outcomes may be reduced or eliminated.

[16] See Social Research Centre Graduate Outcomes Survey.
[17] Bob Birrell, Lesleyanne Hawthorne and Sue Richardson, *Evaluation of the General Skilled Migration Categories* (2006), Commonwealth of Australia.
[18] Engineering Education Australia, Professional Year in Engineering <https://eea.org.au/professional-year-program> at 29 March 2021.

Appendix C: Demand for engineers

Demand for engineering services is highly variable, but generally follows national economic fortunes. A lag indicator of demand is internet job vacancies. In general, as vacancies increase, unemployment falls and as vacancies fall unemployment increases.

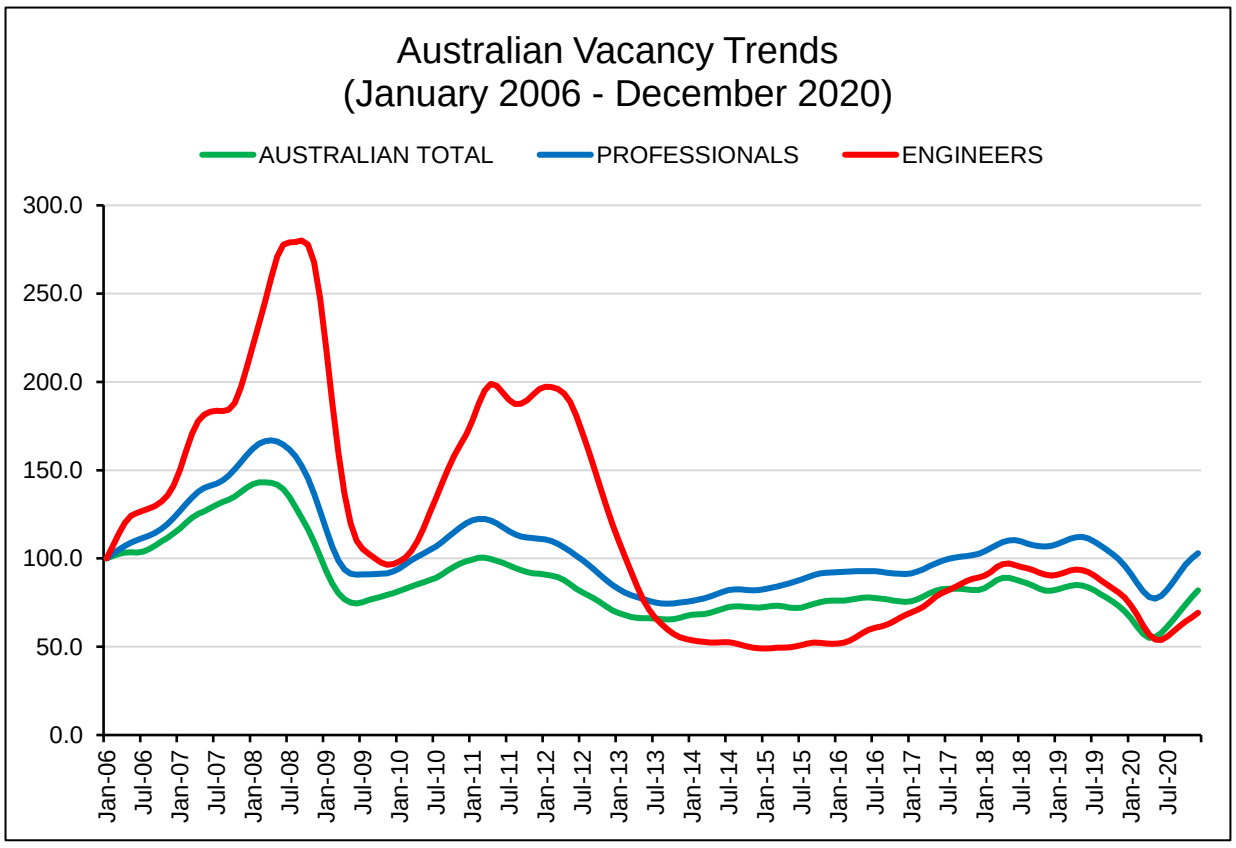
Job vacancy data offers trends (which should not be regarded as definitive numbers) and provides an indication of likely short-term demand, and a longer-term historical perspective.

Historical perspective

The following chart shows the changes in Australian engineering job vacancies since 2006. It compares engineering with other professional occupations, and with all vacancies.

The chart shows the extreme demand for engineering services during the mining boom in the early/mid-2000s, a sudden drop in demand at the beginning of the GFC in 2008, followed by a second mining-induced spike in 2011-2012 before the mining-related demand for engineers collapsed. The end of the mining investment boom coincided with longer term macro trends such as neglect and decline of manufacturing (the second largest industry of employment for engineers) and a widespread reluctance of governments to invest in essential public infrastructure.

A slow recovery commenced in 2016, though it was not nationally uniform and took a few years to reach all jurisdictions (recovery began in the south east, moved north and then washed over the continent to reach Western Australia last). By 2018-2019, demand for engineers had almost reached 2006 levels, but was already on a downward trend by the time the COVID-19 pandemic (and associated effects on global workforces) caused the third massive cut in demand in 12 years.



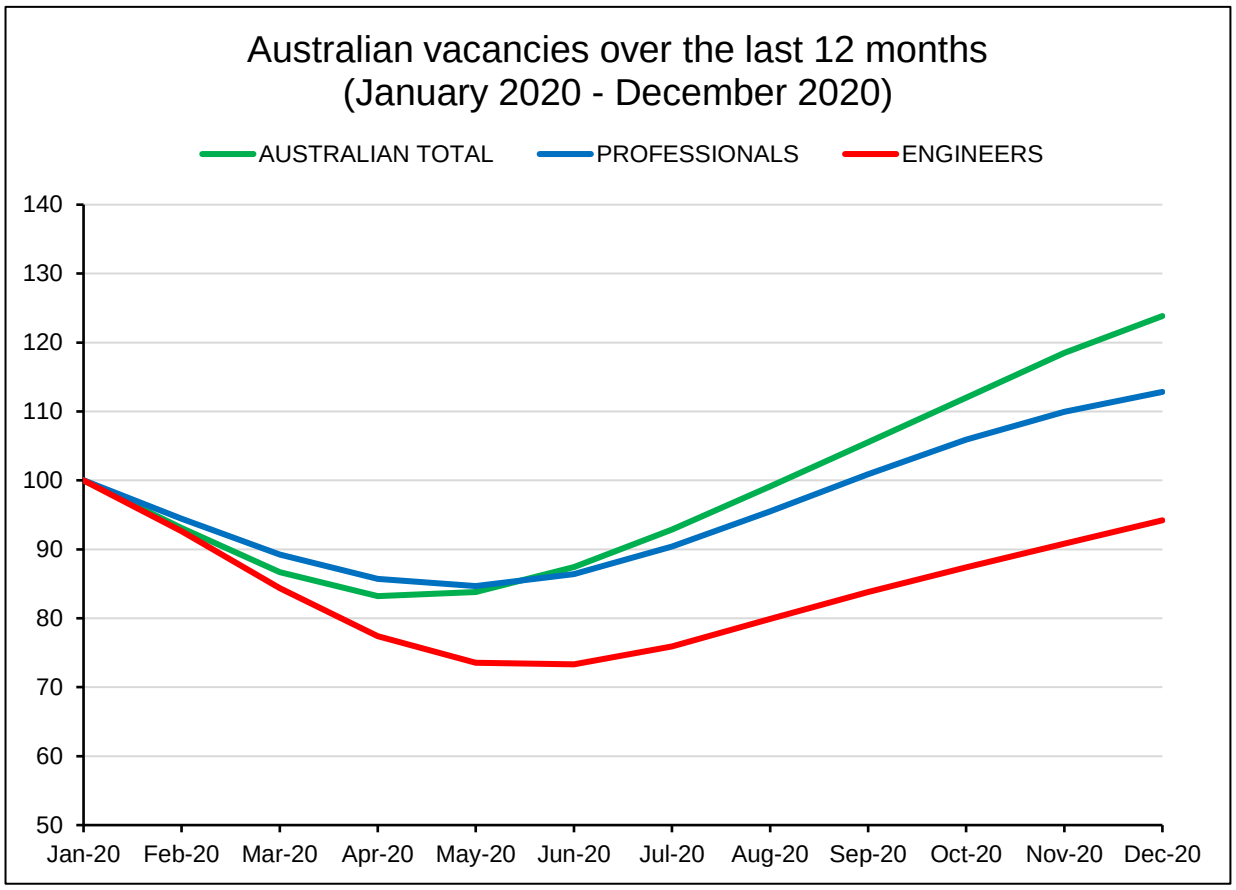
Current demand

Job vacancy data to January 2020 shows that, with the economy softening overall towards the end of 2019, engineering vacancies had still not recovered to pre–GFC levels at the beginning of 2020.

The onset of the COVID-19 pandemic and associated restrictions saw Australian vacancies trending downwards from March to June 2020. However, steady recovery is evident during the second half of 2020 and continues to trend upward. Some key points are as follows:

- Engineering vacancies across Australia in 2020 declined in response to COVID-19 restrictions, from May to June, but began a steady recovery from July 2020 onwards.
- Over the 12-month period, Australian engineering vacancies contracted by 6%. However, in the six months from July growth rates were up 8% and 24% in the last three months from October to December 2020.
- Except for the ACT, all states and territories were recording upward trends in engineering vacancies throughout the second half of 2020.
- South Australia, Western Australia, Tasmania, and the Northern Territory all finished the year recording higher numbers of advertised engineering vacancies in December than in January 2020.
- Civil engineers remain most in demand, followed by mining engineers, and industrial, mechanical and production engineers.
- The least vacancies were recorded for chemical engineers, followed by electronics engineers and telecommunications engineering professionals.

Attachment D in the Department of Home Affairs' consultation Discussion Paper indicate that the trends described here for engineers in 2020 are likely to have continued into 2021.[19]



[19] Department of Home Affairs, *Planning Australia's 2022-23 Migration Program Discussion Paper* (2021) Australian Government <https://www.homeaffairs.gov.au/how-to-engage-us-subsite/files/planning-australias-2022-23-migration-program.pdf> at 26 November 2021.

The need for more data on demand

Job vacancy data is a lag indicator of demand. For a well-planned migration program, lead indicators are necessary.

Example: Engineering Futures, 2035

An example of the profession seeking to identify national needs for engineers is a project by the Australian Council of Engineering Deans (ACED). ACED commissioned a scoping study in 2019 to explore the state of engineering education in Australia and the nature of education to produce graduates for Australian needs for professional engineers in 2035.

The Engineering Futures 2035 project identified required future skills, attributes and knowledge. The project included interviews with thought leaders from industry and the profession and a review of global future trends. A copy of the report and its findings is available from ACED.[20]

Subsequent work has included studies of future professional engineer education program structure, and how the changing nature of engineering is communicated to prospective students and an assessment of the readiness for change within university engineering schools.

The final ACED report is due in May 2021 with calls to action from government, education providers, industry and representative bodies such as Engineers Australia.

It should be noted that as Australian engineering programs change over time, there will be a need to ensure that the skilled migration program remains aligned.

Example: Infrastructure Australia

Engineers Australia applauds the delivery this year of Infrastructure Australia's annual report to the First Secretaries Group, consistent with the request from COAG, considering the capacity of the market to deliver the current infrastructure pipeline.

Undertaken in consultation with jurisdictions and industry, this work will see increased transparency in the pipeline of projects enabling an improved understanding of the demand for skills and materials, alongside increased analysis of supply-side constraints and risks.

A useful feature of this work is the extent to which leadership through COAG, and now National Cabinet, provides a mechanism for partnership and support in delivery in consultation with states and industry, and with the Department of Home Affairs in its design of a long-term migration program.

This kind of project can only be completed by national-level government agencies due to the scope and significant resources required to complete the task.

[20] Caroline Crosthwaite, *Engineering Futures 2035: A scoping study* (2019) Australian Council of Engineering Deans <https://aced.edu.au/downloads/Engineering%20Futures%202035_Stage%201%20report%20for%20ACED_May_16_2019.pdf> at 15 March 2021.

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