



THE UNIVERSITY OF
SYDNEY

Professor Mark Scott AO
Vice-Chancellor and President

24 June 2022

The Hon. Stuart Ayres MP
Minister for Enterprise, Investment and Trade
Minister for Tourism and Sport
Minister for Western Sydney
cc: industrypolicy@investment.nsw.gov.au

Dear Minister,

NSW Industry Policy Green Paper

Thank you for the opportunity to provide feedback on Investment NSW's [Securing future innovation and global competitiveness in NSW](#) Industry Policy Green Paper, released for consultation in May 2022. The University of Sydney strongly supports this initiative and is keen to work with you and the Department to help develop this critical policy. It is timely – following the disruptions caused by the pandemic – to take stock of the key transformative forces that will shape NSW's economy and labour market over the next decade. This will help ensure that the State's industry policy supports our private, public and community-based organisations to maximise outcomes for the benefit of the people of NSW.

We welcome the Green Paper's recognition that the NSW Government alone cannot address the risks and opportunities posed by the various transformative forces confronting our diverse industries. New types of partnering with industry, communities, researchers, investors and education providers will be needed to mobilise and leverage investment, champion innovation and ensure the supply of human capital that NSW's existing and emerging sectors will require if they are to prosper. The [MoUs you have agreed recently with the University of Sydney](#) and all NSW public universities provide an excellent framework for exploring new opportunities for deeper collaboration to progress the Government's priorities, including innovation precincts, growing the State's research infrastructure and capabilities, and improving the supply of skilled workers in priority sectors.

The recognition throughout the Green Paper of the importance of R&D, education and skills development to NSW's future is welcome. This human capital theme complements the Government's [Accelerating R&D Action Plan](#), [20-Year R&D Roadmap](#), [Higher Education Strategy 2021-2025](#) and the significant funding commitments for research infrastructure and initiatives confirmed in this week's NSW budget, for which we are most grateful. We agree there is scope to improve coordination between industry, government agencies and education providers to better integrate vocational and higher education as key components of the NSW industry policy. We are very keen to be part of this specific aspect of the discussion.

The Green Paper's identification of international education as an established sector of strength and potential for continuing competitive advantage is appropriate. According to StudyNSW, before the pandemic struck in 2020, international education was worth \$12 billion annually to the NSW economy and supported around 96,000 jobs across the State. It was NSW's largest services export and second overall. Meanwhile, [independent modelling](#) found that the University of Sydney alone contributed \$5.3 billion to the NSW economy in 2019, supporting some 31,300 full-time jobs across the State.

With Asia's middle class [predicted to reach 3.5 billion people by 2030](#), we agree there will be enormous opportunities for NSW to capitalise on this burgeoning potential market for quality educational services and mutually-beneficial research collaborations. However, Asia's many already advanced and rapidly developing economies are investing heavily and strategically to build their own high-quality tertiary education and research systems.

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International education is an increasingly global sector, with the best and brightest students free to choose where and how they study based on their assessments of quality, value for money, likely career and lifestyle outcomes. NSW's continuing success and growth in international education cannot be taken for granted. There is considerable ground to recover if we are to ensure that Sydney and other parts of NSW remain attractive study destinations for international students from Asia and elsewhere.

NSW's higher education providers face a range of complex regulatory, funding, physical and other barriers that are likely to constrain their capacities to grow onshore international student enrolments significantly, unless substantial changes to current structures and operating models can be achieved. The development of greenfield sites in western Sydney and potentially in regional centres may hold the key for further growth of NSW's higher education sector – to meet expected demand from future generations of domestic and international students.

NSW's public universities are key contributors to the success and growth of international education. They are also integrated with, or repositories of expertise, regarding the transformative forces and priority industries highlighted in the Green Paper. These industries include: Medical and Life Sciences; Defence and Aerospace; Digital Systems and Software; Clean Energy and Waste; Advanced Manufacturing; Agriculture; Resources and the Visitor Economy. Given this, our attached submission answers most of the Department's questions from our perspective as a higher education provider with significant international education and research collaboration activities. For some questions, we have also included insights from our experts regarding the NSW Government's identified priority industries and key transformative forces. Our submission nominates the following three additional and interlinked transformational forces that we expect will shape the NSW higher education sector's transition challenges and opportunities over the next decade:

- **Continuing industry and labour market shifts in NSW's economy:** from resources and goods-producing industries to services and jobs that will increasingly require people with higher-level technical and employability skills and post-secondary qualifications. This shift, combined with industry's increasing desire and need to hire more workers from local labour markets will further increase the demand for education qualifications from NSW's higher education providers.
- **Life-long learning enabled by digital advancements:** the changing nature of work; the increasing need for workers to upskill or retrain throughout their careers to stay competitive or pivot in response to disruption; the increasing demand for affordable and flexible online and blended learning options; and increasing competition from non-traditional higher education providers globally offering innovative delivery models.
- **Continuing globalisation of higher education and research:** including Asia's rise – both as a market for these services and increasingly as a high-quality provider and competitor – and technology-enabled international collaboration in education and research to advance knowledge, develop sovereign capability for new technology-based industries and to address our greatest challenges.

We would be happy to elaborate on these trends and the more detailed feedback included in our submission as the Department develops the Industry White Paper. We trust our input is helpful and look forward to being part of the next phase of the Government's consultations to develop this important policy blueprint and integrated set of supporting initiatives.

Yours sincerely,

(signature removed)

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SECURING FUTURE INNOVATION AND GLOBAL COMPETITIVENESS IN NSW
Investment NSW, Green Paper, released for consultation May 2022

The University of Sydney responses to the department's consultation questions, June 2022

Transformative forces creating challenges and opportunities

- 1. Describe the top two or three transformative forces that will shape transition challenges and opportunities in your industry over the next 10 years. Be specific about the most important transformative forces for your industry. This may include examples from those given above or any others.**

NSW's higher education sector

The University of Sydney, if forced to choose from the many transformative forces that will shape the NSW higher education sector over the next decade, nominates the following three interlinked forces:

- **Continuing industry and labour market shifts in NSW's economy:** from resources and goods-producing industries to services and jobs that will increasingly require people with higher-level technical and employability skills and post-secondary qualifications. This shift, combined with industry's increasing desire and need to hire more workers from local labour markets will further increase the demand for education qualifications from NSW's higher education providers.
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- **Continuing globalisation of higher education and research:** including Asia's rise – both as a market for these services and increasingly as a high-quality provider and competitor – and technology-enabled international collaboration in education and research to advance knowledge, develop sovereign capability for new technology-based industries and to address our greatest challenges.

We welcome the opportunity to elaborate on these points and to provide evidence in support as required as the Department develops the Industry White Paper.

Perspectives from our experts on the transformative forces that will shape transition challenges and opportunities in other key industries in NSW over the next decade¹

¹ The University thanks the following academic and professional staff for their contributions to this submission: Rebecca Murray, Vice-Principal (Strategy); Dr Jeremy Hammond, Director, Strategic Ventures; Professor Julie Cairney, Pro Vice-Chancellor (Research - Enterprise and Engagement); Professor David Hensher, Founding Director, Institute of Transport and Logistics Studies; Professor David Goodman, Director, China Studies Centre; Professor Rico Merkert, Deputy Director, Institute of Transport and Logistics Studies; Professor David Schlosberg, Director, Sydney Environment Institute; Professor Francois Aguey-Zinsou, Lead, MERLin (Materials Energy Research Laboratory in nanoscale) group - School of Chemistry; Professor Brent Kaiser, Director, Sydney Institute of Agriculture; Professor Bill Pritchard, Head, School of Geosciences; Professor Jennifer Whyte, Director, John Grill Institute of Projects; Professor Ken-Tye Yong, Associate Dean (External Engagement), Faculty of Engineering; Dr George Carayannopoulos, Head, Research and Development, Faculty of Medicine and Health; Tim Payne, Director, Higher Education Policy and Projects.

Transition to net zero emissions by 2050 and the next energy systems

- One of the most significant challenges NSW faces is reducing emissions associated with passenger vehicles and trucks - the latter to a lesser but highly relevant extent as these dominate the contribution of the land-based transport sector. Similarly, a focus on decarbonisation (and shift to automation) will cause transformation in the airline industry.
- Another challenge/opportunity will be the growing demand from local communities for participation in transition/transformation planning, including a related need for shared benefits/local compensation. This is the local manifestation of '*climate justice*'; ensuring communities are not left behind in decarbonisation. To date, most public policy work on net-zero/decarbonisation has been at the federal or state levels. There will be an increasing focus on local government policy-making around issues including transport, housing, energy and planning. Consequently, there is a need for more/improved public policy development and analysis of pathways to decarbonisation.
- There is an opportunity for the NSW Government to work more closely and strategically with universities in the energy sector. In many other countries, energy research has been classified as 'sensitive'; resulting in controlled collaboration to manage the strategic and economic advantages arising from key innovations. Countries like France and Germany have already used this approach in the hydrogen space. France, for example, has released €80 million for hydrogen labs to increase their critical mass. Relying on imported technologies (e.g. in hydrogen technology) could be a major misstep that will impact the State for many decades as we are transitioning to the next energy systems.
- Finally, as the economy and energy systems shift, consideration will need to be given to our urban infrastructure – for example through the repurposing of assets.

Building a circular economy

- The circular economy is fundamentally about recovering lost value and resources through systems that are regenerative by design.
- One of the main contributors will be electric cars and trucks, including the full circular economy challenges in the manufacture, delivery, maintenance and ultimate end of life disposal.

Capitalising on growing consumer markets in Asia

- One of the crucial unknowns in dealing with China is the uncertainty surrounding its government's current commitment at any level to marketisation. Current policy seems directed at encouraging marketisation at the local (city prefecture) level, while at the same time, the state-owned sector is both reluctant to marketise, and the central government seems uncertain about pushing state-owned enterprises to marketise further.

Agrifood, climate change and the digital economy

- The impact of climate change on Australia's food productivity and quality. We are already experiencing fluctuations in supply and stability across the industry and the direct impacts this has on food supply chains. Climate change pressures will increase the volatility of the industry.
- Transport connectivity to enhance productivity and supply of food to domestic and international markets. Increased priority of logistical support over that of traditional mineral focused transport systems.
- Digital integration and data sharing of farming enterprises across Australia.

Meeting the needs of an aging population through innovation

- Integration of health with infrastructure and employment in context of an ageing society (walkability; urban and regional amenity).

Project leadership and resources

- A big 'mindset' shift will be necessary to see projects as interventions into existing natural and engineered systems. This will require thinking broadly about the sort of future we want as a society and about how that can be implemented without breaching planetary limits. Much upskilling will be needed, as fundamentally different types of projects will be required. The need for project leadership in a changing world will increase, with new technologies (digitisation, artificial intelligence (AI) etc), organisational structures (more complex sets of stakeholders),

and ecological understanding. In sectors such as transport, energy and construction it will involve sectoral change, and a rapid transition away from forms that use fossil fuels.

2. What effects do you expect these transformative forces will have on your industry (or on your own business) over the next 10 years? If any transformative force is of greater significance to your industry, explain why, with specific examples of the expected opportunities and challenges for your industry or business.

NSW's higher education sector

Industry and labour market shifts

- NSW's economy and increasingly services-based industries are likely to continue to demand more workers with higher-level skills and qualifications.
- The State's tertiary education system will need to play a critical role in preparing both domestic and international students to meet the economy's needs, in concert with internationally competitive temporary and permanent migration policies developed with the Australian Government.
- Ensuring that NSW's tertiary education sector has the resources and regulatory flexibility to expand and innovate in response to changes in demand from students and industry should form a critical part of the State's new industry policy.
- To this end, there will be a need for the NSW Government to work with the new Australian Government and the higher education sector to ensure that Commonwealth policy and funding relating to students (both domestic and international) and research, is fit-for-purpose.

Life-long learning enabled by digital advancements

- The increasing digitisation of education (and other industry sectors) will continue to re-shape how tertiary education is delivered globally, enabling diverse flexible models of learning and training that meet the needs of future students and employers.
- Digital disruption will enable new low-cost and scalable education delivery models that are not constrained by geographical presence or physical infrastructure and capabilities.
- Advances in digital technology will continue to provide opportunities to create new and uniquely interactive and experiential learning models, tools, and experiences (e.g. Virtual Reality, AI, Machine Learning).

Globalisation of higher education and research, including Asia's rise

- New (non-traditional) entrants will continue to emerge and introduce new offerings and learning models to compete with traditional place-based and face-to-face models (e.g. Google Education, Dyson Institute, Atlassian University, Deloitte University, Torrens University, Avondale University).
- Global universities with strong brands, reputations and resources are likely to provide new award and non-award study options for NSW residents and competition for the State's universities, whether through digital delivery or the establishment of physical presences in Australia.
- According to the [BCA's June 2020 Living on Borrowed Time](#) report, Asia's middle class will reach 3.5 billion people by 2030. Asia's continuing economic development will provide enormous opportunities for NSW universities to capture a larger share of the region's students seeking a quality tertiary education.
- However, governments throughout Asia have been investing strategically and significantly in their own tertiary education and research systems, with the quality, ranking performance and reputations of Asian universities and other providers expected to continue improving rapidly.
- For NSW's international education sector to remain competitive, we need to ensure that the State continues to be recognised as an attractive, high quality, affordable, safe and welcoming study destination for international students, as well as a source of high-quality fully online or blended courses for students in Asia and beyond.
- There will also need to be a sustained focus on strengthening the research capability (both people and infrastructure) within NSW's universities and in collaboration with industry and government agencies, so that we can participate fully in international research collaborations and take advantage of the vast amount of new knowledge and technological advances that will continued to occur overseas.

Perspectives from our experts on the transformative forces that will shape transition challenges and opportunities in other key industries in NSW over the next decade

Transport, infrastructure, logistics and supply chain management

- With a substantial switch to electric cars forecast to occur over the coming decades, the general position of transport experts is that the cost of an electric vehicle will become significantly less than a petrol or diesel car, and that the cost of using electric vehicles will decline. Simple economics suggest that the electric private car will eventually be more affordable and more attractive to use. A notable increase in car kilometres travelled can be expected. It is plausible that unless road pricing reform is seriously contemplated by governments, congestion will increase significantly as a result of the movement to green energy to reduce (if not eliminate) end-use vehicle emissions. The challenge is to balance many relevant objectives and not net zero emissions at any price.
- Due to the reduced impact on the environment, aviation will become increasingly popular once again with positive effects on travel, tourism and global supply chains. The challenge is what occurs in the interim, until that transformation is complete.

Clean energy and waste / environmental politics

- Controlling energy resources and the related knowledge generation will be fundamental. There is a need for vision and a strong mechanism to enable a 'Marshall' type recovery plan for the energy sector to ensure that NSW does not fall behind in an area that is critical for the economy and national security.
- Hydrogen is not a natural resource that can be extracted like oil/gas. It needs to be made and stored with advanced technologies. These require intellectual capability that only a strong R&D/university/industry sector can support.
- From the social sciences/policymaking frame of reference, developing and implementing democratic innovations will be critical: citizen juries; participatory adaptation pathway planning; more formalisation of community-based emergency response to climate impacts etc. Given the uncertainties of both climate impacts and a rapidly changing economy, democratic legitimacy of decision-making at the local level will be key.

Agriculture and Agrifood

- Climate pressures are likely to disrupt productivity and destroy food supply chain certainty.
- A collective integrated industry will need to be developed to minimise food supply risks.
- Access to all macro nutrients for all communities (e.g. protein or fresh food) will need to be maintained/stabilised.
- The availability of efficient, cheap and reliable transport limits productive zones across Australia. Inland rail will be helpful, but port connectivity and rail access will need improvements.
- A lack of digital connectivity disrupts farm productivity and limits integration from paddock to fork. A holistic system must be in place to maximise industry resilience to climate change, markets, logistics and long-term sustainability.

3. What action is your industry or business taking, or intending to take, to address the effects of these transformative forces?

NSW's higher education sector

The University of Sydney is in the middle of developing its strategic plan to 2032. Our ambitions for our next strategic plan are to:

- be a globally oriented university committed to achieving, sustaining and enabling excellence across all our teaching and research
- create value for the communities we serve
- ensure that all members of our community contribute to our next strategic plan.

We are exploring a range of themes, including excellence in research and education, our student and staff experiences, the role of place and space, and our relationships with industry partners and our broader communities. We would be pleased to engage Investment NSW around our strategic

planning and to discuss the actions we are already taking to address the effects of the transformative forces we face, for example:

- Implementing strategies to diversify the countries we draw international students from - investing to grow recruitment and partnerships with India, South-East Asia and the Americas.
- Focusing our efforts and resources to improve access by underrepresented cohorts of domestic students including those for low socioeconomic backgrounds, regional and remote communities and [Aboriginal and Torres Strait Islander students](#).
- Redesigning our undergraduate curriculum to ensure we are developing in our students the 'T-shaped' qualities that our research shows that Australian and overseas employers are increasingly seeking. T-shaped workers have excellent knowledge of and skills in specific disciplines and are also excellent at critical thinking, problem solving, communicating and collaborating with colleagues from different backgrounds, skills and perspectives. See University of Sydney [Undergraduate Guide](#) and [Graduate Qualities](#).
- Strengthening our engagement with employers to ensure our course offerings at different levels are meeting their needs, to provide our students with high-quality Work Integrated Learning (WIL) opportunities during their studies and identify opportunities for research collaboration. For example, through our award winning [Industry and Community Projects Units \(ICPU\)](#), our student work in multidisciplinary teams to address authentic real-world problems and projects set by our partners.
- Improving the learning experience and support services available for our students; pivoting rapidly to deploy online and blended teaching options students during the disruption caused by the extended COVID-19 lockdowns and border closures; adapting to NSW Government health orders and the preferences of our students, staff and industry partners (including throughout the NSW health and school education systems).
- Investing in and focusing our efforts to strengthen our partnerships with industry and with government agencies in research fields and innovation precincts of strategic priority to the government.
- Increasing collaboration with other universities in high priority fields for NSW (e.g. STEM, digital sciences, medical & health, quantum technology).
- Developing our academic capability and transitioning our operating model and infrastructure to achieve our sustainability targets.
- Continually focusing on understanding opportunities for improvements in productivity through better technology, processes and organisational redesign.

Perspectives from our experts

Agriculture and Agrifood

This sector is addressing the effects of these transformative forces through:

- Sustainable farming practices and improved plant and animal R&D to combat drought, heat, floods, disease, soil health and energy use.
- New inland rail.
- Individual approaches for data collation, limited national coordination across all supply chain participants.

Transport, infrastructure, logistics and supply chain management

This area is addressing the effects of these transformative forces through:

- Improved communications on the environmental and other associated benefits of zero emissions at the tailpipe.
- Getting electric vehicle supply into the market, finding appropriate incentives to attract purchases away from internal combustion engine vehicles but also reprice the use of electric cars to constrain the growth in traffic congestion associated with lower usage costs.
- Identifying road pricing policy reform as a priority.
- Offsetting, target setting, investment into sustainable aviation fuel (produced from sustainable feedstocks and very similar in its chemistry to traditional fossil jet fuel) and more fuel-efficient aircraft and operations.

Research, place and global value chains

- There is a fundamental rethink occurring of the place of universities in society, both as spaces for learning and as spaces for research.
- Remote learning during the COVID-19 pandemic has opened a new appreciation of how things can be done. In research, universities' social licenses to operate are being reconsidered in the context of new ways of connecting research to industry and community needs.

Business operating environment

4. Are there critical constraints across the business operating environment (for instance, related to markets, skills, production capacity, technology, finance capital or infrastructure) that affect the capacity of your industry or business to take up opportunities? If so, please describe them and outline any actions you are taking, or would like to take, to address them. Examples might include any gaps or concentrations in input or product markets that affect opportunities for long-term growth in your industry; issues specific to SMEs; a lack of shared infrastructure or research capacity; or a shortage of capital or skills (including managerial skills).

NSW's higher education sector

We have set out below some of the key constraints currently affecting the University of Sydney capacity to take up opportunities for growth and to enhance the contribution it makes to people of NSW.

- Commonwealth regulation and funding models related to enrolling domestic students and conducting research that do not always support or incentivise growth in areas of priority skills and research need, nor diversification at an institution level.
- Attracting and retaining top global talent in a highly competitive environment to deliver our academic and business improvement activities and initiatives. Skills and talent are finite in many fields where we compete for the best people with globally-renowned institutions and private sector firms. Australian visa and migration policy is generally supportive for recruitment in fields of recognised skills shortage. However, our programs for attracting skilled temporary and permanent migrants need to be regularly reviewed and refined to ensure that they remain globally competitive.
- Demand-side challenges in industry's eagerness to invest in R&D in collaboration with public universities, with great potential for NSW Government policies and incentive schemes to influence business behaviour.
- Developing strategic partnerships with industry partners to achieve mutually beneficial outcomes – challenges in agreeing to IP ownership and equity in research and innovation partnerships.
- Government (Federal, State, Local) policy and priorities that sometimes constrain our research and education initiatives – including potential misalignment between government and industry partner priorities.
- Securing funding to provide key infrastructure assets to facilitate business, productivity and innovation – including designated precincts to enable agglomeration benefits and synergies.
- Delays in planning approvals for capital developments can impact the University's implementation of strategic priorities, contributing to cost-blowouts, missed or delayed opportunities.
- Complexity of technology changes to large (and ageing) core systems slows improvements.

Perspectives from our experts

Capitalising on growing consumer markets in Asia

- Aviation will be critical to re-establishing, connecting and growing consumer markets in Asia in terms of education/students, visiting friends and relatives (VFR), tourism and international freight/logistics.
- There are new geopolitics in Asia to which NSW industries needs to be alert. Future growth in exports and people flows will be more South Asian than East Asian. NSW universities have been relatively slow with respect to India, with Victorian universities securing stronger

relationships to date. There is an opportunity for NSW universities to work strategically with the NSW Government to catch up on their Victorian counterparts.

- In China, while consumerism in both goods and services is highly digitalised, there is a major opportunity to present educational programs online. The experience of higher education providers during the last two years of the pandemic is certainly helpful in this regard, however, more product development is needed, particularly in STEM subjects. Changes to Federal regulation of international education will be required if Australian higher education providers are to be able to continue offering award courses fully-online.

Transition to net zero emissions by 2050

- There is an urgent need to upskill the NSW workforce to handle the transition to net zero emissions. A different focus on training is required to ensure that net zero thinking is incorporated into all education. This is particularly important in the case of:
 - Engineering and building design, where decisions about the design of infrastructure, facilities and processes has a direct influence on the embodied and operating emissions over the life of the infrastructure or facility; and
 - Business, where a robust understanding of the role of the capital markets in driving the transition to net zero will see private capital mobilised to fund the net zero transition.
- The move to net zero emissions in land-based transport has highlighted the very narrow historic focus on the industry in which the main stakeholders sharing all risks have been the regulator and the owner/operator (under contract or otherwise). With an increased role of the original equipment manufacturers (OEMs), energy suppliers, battery pack providers and network technical and financial planners, we need to seriously revisit the need for a new set of partnerships linked to de-risking the supply chain. This is as much about education and trust as it is about institutional/regulatory reform.
- A good example is zero emissions buses (ZEBs) where NSW needs to move beyond the regulator and the bus operator. There is a need for a paradigm shift from traditional contracting i.e., contracts between government and operator, to contracts or management agreements between government and consortiums that account for the entire supply chain i.e., energy, OEM, asset owners, and operators, to give the government certainty of service continuance in a ZEB era. It is not unusual for all parties benefiting from an action to be party to the contract. This is essentially what a proposed Supply Chain Partnership (SCP) model presents, which shares the risk and promotes a competitive process spread over the supply chain.
- A key focus of decarbonisation will be electrifying homes and increasing efficiency. There is a huge opportunity to build multiple industries around improving housing stock. There are also co-benefits here – health benefits from improved air quality that comes with decarbonisation and protection from higher temperatures as housing is made more efficient.
- The energy transition will be very fast (possibly within 10-20 years) and may have huge positive and negative impacts. We need to define the essential skills as 4-7 years is required to train people; determine how to increase the critical mass of the researchers needed and ascertain how to effectively translate and develop innovation. We need centralised national facilities that link industry, innovation, and research expertise in meaningful ways. We need to be able to train through accomplishment, and for this we need facilities dedicated to hydrogen technologies, not only for developing the industry that will be able to certify Australian projects, but also to support home grown innovation. We have high-end well-equipped laboratories but we have nothing in between to take technologies to full Technology Readiness Level (TRL) 6-7 where we can test at scale.

Harnessing new opportunities and managing risks in global value chains

- International freight is booming, therefore, removing bottlenecks and enabling innovation will make global value chains more efficient, flexible and resilient.
- Air cargo is also playing an increasingly important role with some of the large shipping lines and freight forwarders now acquiring stakes in airline businesses. Greening global and local value/supply chains should be seen as a wonderful opportunity.
- In the infrastructure sector there are opportunities to build local capability and also learn from international partners. Planning for programs of work - with repeated projects - will provide opportunities for more certainty in supply chains, and enable innovation in digitalisation and modular construction – a particular opportunity in areas such as the new energy market.

Agriculture and Agrifood

- Australia is slowly developing an alternative protein food industry using existing resources (legume grains, other crops and protein inputs) and linking with manufacturing industries to deliver foods and ingredients. Consumer demand (domestic and international) is significant, however, the industry components are poorly linked and coordinated. The industry lacks skills, R&D resources and coordination to develop and compete with external entities. NSW would benefit from a shared infrastructure and research capability to take advantage of our rich supply of primary ingredients and concentration of food industries.

5. Why would your industry be a suitable target for demand or supply side industry policy interventions over the next 10 years? Where in your supply chain would this intervention be most effective, and why? Please be specific and include evidence as to why your industry would not be able to resolve this issue without government action.

NSW's higher education sector

The education, training, research and translation activities of NSW's public universities are suitable targets for both demand- and supply-side State-based industry policy interventions because of the significant economic and other benefits they deliver for NSW's communities. According to the OECD, 50 per cent of all economic growth in member countries results from innovation and are enabled by improvements in labour productivity and advances in technology. At the firm level innovation makes a clear difference, with innovation-active Australian businesses 40 per cent more likely to increase income and profitability, twice as likely to export, and two or three times more likely to report increases in productivity, employment and training.² According to Universities Australia - citing the Federal Industry Department - the impact is equally clear at a whole of economy level, with R&D intensity explaining up to 75 per cent of total factor productivity growth. There is a high return on investment: 10 to 30 per cent for private returns and more than 40 per cent for social returns.³

The University of Sydney and other NSW universities have world leading expertise that can contribute to industry R&D and generate IP that can be commercialised by industry, with flow on benefits for jobs and economic growth. Industry engaging with universities for R&D also has the benefit of aligning university expertise with industry needs. NSW's universities are keen to engage with industry but often find that businesses are reluctant to invest in R&D and partnering. Our overall experience is that any well-designed state government programs that provide grants or other forms of financial incentives for business to engage in research collaborations with universities are extremely helpful - even when the amounts of funding are relatively small. NSW universities are working hard to increase levels of collaboration with industry, however, additional investment and incentives from the NSW Government targeted at supporting business/university collaboration for human capital development and R&D priority industry sectors would be certain to deliver strong returns on investment.

Perspectives from our experts

Transition to net zero emissions by 2050

- The transport sector will have to engage much more with the energy sector and vice versa to capitalise on their skill sets and visions designed to achieve the de-carbonisation targets in the transport sector in particular. The University of Sydney is contributing to this with a very recent example of a substantial donation for a new Chair in Sustainable Transport Futures, designed to be a lead activity at the University in engaging with industry and government in a way that academia can contribute to enhancing successful decarbonisation outcomes.
- Energy transition already requires skills now. Any expectation that someone who has worked in liquefied natural gas (LNG) can simply retrain to work with hydrogen is naïve. Hydrogen has its own complexity and training will take time. We will need to accelerate the rate at which we can train and retain skills.

² Department of Industry 2016, *Australian Innovation System Report 2016*, p.1

³ Universities Australia, *Submission to the Productivity Commission inquiry into productivity*, March 2022, p.8

Harnessing new opportunities and managing risks in global value chains

- Coordinating food supply chains is a primary target for intervention. This is particularly relevant for the industries that will benefit from a value-added opportunity. From a food context, transitions across the farm gate are required, where manufacturing industries and consumers are intimately linked to traditional production enterprises to maximise value and opportunity.

6. What are the key areas and opportunities in your industry where there are opportunities for NSW Government programs and actions to accelerate ongoing economic growth?

- Promotion and protection of international education export markets – e.g. working with NSW universities to help them to diversify source countries and improve alignment of enrolments with NSW's skills needs in areas including health, teaching, other professional scientific and technical services.
- Providing incentives and financial support for research and innovation commercialisation to create new ventures, jobs and export markets.
- Promote and support education and training in high tech industries to deliver the skilled workforce to meet the needs of NSW industry.

Perspectives from our experts

Transition to net zero emissions by 2050

- The approach of the NSW Government to support the construction of enabling infrastructure for renewable electricity and hydrogen should be continued and expanded to cover the decarbonisation of transport.
- Through electrifying housing stock and making it more efficient, there are numerous opportunities for economic growth - from builders, to manufacturers of heat pumps and efficient windows, to energy generation and storage. The key intervention here is the development of public policy at the local council level, in addition to State and Federal.
- The University's [Institute of Transport and Logistics Studies \(ITLS\)](#) is currently active with Transport for NSW in finding ways to reduce emissions in the transport and logistics sectors; mindful of the wider set of impacts that must be considered in a benefit-cost-economic impact context. A recent example is identifying ways to stabilise, if not reduce, vehicle kilometres of passenger cars as we transition to lower cost of using electric cars.
- The NSW Government has put in place its strategy including the net zero aims. However, the level of funding to support this vision is relatively small and also accompanied by the expectation that this funding will act as an incentive for industry to leverage. This may be true, however, we note that the result is that public funds are being provided to the private sector and foreign investment to develop energy systems in Australia that will only generate benefits for the shareholders of these companies. These funds should be amplified and used to incentivise Australian private capital to invest in the future to create real benefit for the domestic market and real jobs at scale in Australia (not overseas where the manufacturer of the technology will supply the Australian market and in fact grow the economy of their own country by doing so). This includes serious investment in the university research sector to enable local innovation and sovereignty, and weighty policies to force the Australian industry to transform and work with the university sector to do so, so the transformation is informed by experts in their own rights.

Harnessing new opportunities and managing risks in global value chains

- There are several opportunities for NSW Government action in construction and infrastructure development, particularly in the associated new industries – retrofit, green development, project analytics, modular off-site construction.
- There is an opportunity to boost aviation infrastructure such as Sydney Western Airport, including ground access transport for both passengers and freight. University of Sydney research in causality analysis has demonstrated that this will boost economic growth.
- Digital infrastructure is also critical, in particular the ongoing investments in spatial data.

Community views

7. Considering the transformative forces underpinning economic structural change, such as those described above, what are the benefits to NSW citizens of adequate and well-coordinated industry policies that accelerate this change? Please provide specific examples, and where possible link them to one or more of the transformative forces.

NSW's higher education sector

- Economic growth, innovation and productivity that drives growth in jobs, incomes, investment, tax revenues and critically social wellbeing.
- Attracting capital investment from industry to locate in NSW because of availability of a highly educated and skilled workforce, world class R&D infrastructure, innovation precincts and mutually beneficial training and R&D collaboration between industry and universities.
- Meeting skills and innovation needs of NSW industries, ensuring jobs growth and opportunity for citizens to upskill and retrain throughout their careers.

Perspectives from our experts

Capitalising on growing consumer markets in Asia

- Our food exports (commodity and manufactured) will rely on access and acceptance within South-East Asian markets. There is significant demand for products due to their quality and the certainty of production. Our food industries need to respond to growing demands from Asia and meet them consistently and reliably.
- The need for knowledge of and exposure to China are crucial for organisations that wish to offer training and education for the new opportunities being created at the level of city-prefectures in China in socio-economic service provision of all kinds. Despite the central government's commitment to move in this direction, there are limited programs in China's higher education sector at present to meet the workforce needs. There is a 10-year window for growth where local government will be seeking external advice and expertise. The need will be for expertise in technical areas (welfare, social services, environmental management) and also in institutional development.

Transition to net zero emissions by 2050

- Decarbonisation policies can be designed to address existing inequities, including those in health and climate risk. Air pollution from coal mines, transport, and burning, for example, impacts the least well off and already disadvantaged communities. Similarly, heat waves mainly kill people who cannot afford to install or run air conditioning. Properly designed policies for decarbonising housing could simultaneously address these key health and climate inequities.
- A critical concern is that government may fail to appropriately address the energy transition, resulting in many NSW citizens paying more for their electricity and water bills because of the competition with hydrogen for export. Current understanding is that hydrogen is just another business opportunity, however, this assumption is incorrect. Hydrogen is an energy transition with many impacts across society and far from business as usual, therefore, expertise from the university sector will be critical to enable this transition with science-led decision-making.
- Given the benefits to the environment of natural resource management, a focus on revegetation and enhancing soil carbon will provide broad environmental benefits for NSW citizens, as well as supporting the transition to net zero. A well-developed NSW Government program in this space would also provide economic and employment benefits to regional NSW.

Harnessing new opportunities and managing risks in global value chains

- The challenges of net zero emissions requires a removal of sectoral silos to enable sharing of risks and benefits across many sectors. Many of the solutions will be technological and behavioural, however, they must have clarity in terms of government-led policy settings. This is currently lacking and universities are well placed to contribute to the development of these new frameworks within which to deliver improved climate change outcomes. Education of the next generation of 'thinkers' is essential to break many of the sectoral molds we have in place today.

8. Where do you think the NSW Government could make the biggest difference to encourage industry innovation and growth?

NSW's higher education sector

- NSW already leads the way in Australia in start-ups and spin-outs from university R&D but there remains great potential to further improve its performance through strong policy and incentive structure developed with insights from local start-up founders, venture capital firms, universities, TAFE and the Sydney School of Entrepreneurship.
- There is an opportunity for the NSW Government to work with the State's higher education sector to develop a sustainable model to increase international student enrolments in skill priority areas like health, teaching and other professions where the sector's capacity for growth and innovation is constrained by the available of professional placements for international students.
- Continuing targeted investment in research and educational infrastructure in areas of priority for NSW and where we are or have the potential to be world-leading: quantum computing; bioscience and biomedical science; advanced manufacturing; renewable energy; health and medical science; biotechnology and medtech; engineering and construction etc.
- Providing quality data and information resources to industry to support investment decision making and R&D activities.
- Better co-ordination and support of industry innovation and investment – facilitate rather than control.
- Implementing the Innovation and Productivity Council recommendations developed through evidence-based research and deep consultation with industry, the higher education sector and communities.

Perspectives from our experts

Transition to net zero emissions by 2050

- There are major gaps in the technology needed to deliver net zero emissions by 2050. One of the gaps is in sustainable fuels, in particular, sustainable aviation fuel (SAF). NSW is also running out of landfills for organic waste disposal. There is an opportunity to promote the redirection of organic waste for landfills to the production of SAF. This also aligns with the circular economy theme.
- The NSW Government could focus on stable, long-term policy projections that incentivise change. There could be a provision of financial support for local councils to conduct long-term transition and adaptation planning.
- Proper planning and sensible mechanisms put in place, with serious investment made through strategic partnering rather than fully competitive schemes, which often take one year to assess and result in lost time when some product development moves so quickly.
- Investments in digitisation and spatial data and linking this to community-led needs.

Harnessing new opportunities and managing risks in global value chains

- Provide transparent policy settings to enable industry to invest in and contribute to a partnered outcome in reducing emissions and enhancing a wider set of societal benefits.
- Sponsor industry-academia partnerships/projects that investigate innovative ideas.

9. Are there any risks or costs from intervention that the NSW Government should consider?

NSW's higher education sector

- Bureaucracy constraints impeding the pace of positive economic/societal change.
- Uncertainty in the direction of Federal and State policies relating to critical industry sectors for which responsibilities overlap – e.g. energy, health, tertiary education.
- Intervention always has the inherent risk of unintended consequences. The NSW Government should be conscious not to stifle innovation through poor policy formulation and execution.
- Minimise policy costs and impediments through well design policy reform and initiatives to ensure less friction as possible to industry.

- Delays in policy development or action from the NSW Government adversely impact industry – creates uncertainty, indecision and investment delays.
- The Innovation and Productivity Council provides a strong structure and mechanism for ongoing dialogue between the NSW Government, industry and higher education about measures to drive innovation and productivity growth across the NSW economy. The work of Council could be embedded more effectively into the NSW Government’s policy development processes.

Perspectives from our experts

Capitalising on growing consumer markets in Asia

- There is a risk is that political uncertainty in China may adversely impact the development of consumer markets.

Transition to net zero emissions by 2050

- A risk/cost are national security and foreign interference (including investment) concerns especially in the energy sector. There is a need to move away from political debates and forming a united front across all views to move forward the important agenda of the energy transition. This can be achieved by engaging all expertise across the State (including the regions) to work together and build the critical mass.
- A risk/cost of programs which support electric vehicles (EVs) is that due to their prohibitive cost, only well-resourced families can afford them. This is despite all residents ultimately funding these programs. A suggestion is that government could work with the private sector to reduce the non-financial barriers to EVs (i.e., charging stations), however, manage this through changes in planning controls or other non-financial measures.
- The risk of inaction in this space is that we get to a point of global warming where there is no return. This is a sobering thought and time is not on our side.

Harnessing new opportunities and managing risks in global value chains

- The main risk is a perceived failure of government to preserve a clear mandate of change that enables the private sector to invest in a way that all risks are due to other factors and not government. This will be a challenge with one example being battery vs hydrogen fuel sources for buses, trucks in particular, but also for trains and ships. Our assessment is that 70 per cent of the investment in one energy technology is portable between fuel sources.

10. What information would you like to see to demonstrate how progress is being made towards accelerating industry growth through NSW Government programs and actions?

NSW’s higher education sector

The University supports the [NSW Innovation and Productivity Scorecard](#), which provides a regular snapshot of NSW’s performance in these areas compared with other states and selected international economies. We liked the way the Innovation and Productivity Council has developed the original scorecard (published in 2018) in consultation with higher education institutions, academic experts and other stakeholders, and refined its content over time. Additional metrics could be added to future scorecards to measure growth in priority industry sectors, including higher education.

There would also be value in the Department reporting regularly on the industry policy initiatives that are trending in the right direction and those that are not - in particular those that have been trialled in Australia and globally. This will help ensure that the transfer of evidence to a local context is clear and appropriate. The early engagement of university experts can also assist with the establishment of robust and objective approaches to data collection to inform the ongoing evaluation of the effectiveness of different policy interventions.

Views on current industry programs and actions

11. What are your views on how well the current selection of NSW Government programs and actions enable change at the industry level? For example, are there too many or too few industry programs; are they too small scale to make a difference at the industry-structure level; are the effects likely to be ongoing beyond the life of the program or limited to the program period?

NSW's higher education sector

We are not able to answer this question adequately in the time available due to the very large number of NSW Government programs across so many agencies that are directly or indirectly relevant to the University's operations. However, we would be pleased to discuss these issues with the Department if that would assist.

Perspectives from our experts

Harnessing new opportunities and managing risks in global value chains

- We are all in the learning mode and typically at the beginning of the innovation adoption curve, there is a lot about technology but unfortunately much less focus on exposing society to understanding new options, gaining familiarity etc.
- The latter entails 'nudging' and gamification and we should support many investigations as a way of identifying those that demonstrate the greatest merits. Trials are of immense value, however, they must be transparent so that we learn as much from failure as we do from shared success.

Medical and Life Sciences, medical technologies and pharmaceuticals

- Medical and Life Sciences are a key industry within NSW. The COVID pandemic has demonstrated the importance of both the health workforce and R&D efforts to support emergence from the pandemic (i.e., development of digital health related scale-up and pivot required).
- To drive improved industry engagement there is a need for sustained investment in a programmatic format. Currently, there is a range of programs that operate across the Office for Health and Medical Research, Investment NSW and also through the Medical Research Future Fund (MTRFF) Medical Technologies and Pharmaceuticals (MTP) related programs and calls which arise (noting this is not a state domain). This can, at times, create a 'patchwork' rather than allowing for a longer-term vision and makes the navigation of programs difficult due to the multiple entry points and administering institutions. This needs to be considered, otherwise it is likely that the benefit and impact will not be sustained beyond the life of the programs. A clear definition of where/what funding is available at a point in the life course of a project e.g., proof of concept (scientific and commercial) funding is required to optimise programs.
- It is recommended that research related programs and researcher/staff development programs be harmonised so that they are mutually reinforcing. These should provide more opportunities to embed academics and professional staff into industry and vice-versa.

Clean Energy and Waste

- The scale of investment is not sufficient, and there are too many small-scale competitive grants which do not necessarily lead to significant impact/acceleration, and are not really directed at building an ecosystem. In the energy transition we need collaboration to rapidly transform.

Agriculture and Agrifood

- The NSW Government is investing in logistical and industry support to enable change in the food industries. However, the level of engagement is small or unfortunately complicated by unrealistic job targets (e.g. Jobs Plus Program), certainty of investment opportunities, and/or a perceived unwillingness to integrate government agencies to work seamlessly across metro and rural areas. Critical investments are being held up due to uncertainties regarding services in Western Sydney (power, roads, land availability). There also seems to be an over-reliance on private investment to enable new jurisdictions to develop capabilities. This works perfectly

well for large land development companies (housing etc), however, is difficult for new industries to establish themselves.

12. Describe any current programs and actions that have made a notable difference to productivity and competitiveness in your industry? Please include how they have made a difference.

NSW's higher education sector

As above, due to the very large number of NSW Government programs across so many agencies that are relevant to the University's operations, we are not able to answer this question adequately in the time available. We would, however, be pleased to discuss these issues with the Department if that would assist.

Perspectives from our experts

Medical and Life Sciences, medical technologies and pharmaceuticals

- Programs such as the '[Researcher Exchange and Development within Industry](#)' initiative (Commonwealth Department of Health) have significant potential and involve embedding research staff within industry settings. This allows for a more fluid movement of knowledge and capability across sectors. Opportunities may be usefully thought about at state level and across sectors.
- Programs such as the '[Translational Research Grants Scheme](#)' (TRGS) - funded by the Office for Health and Medical Research - could be expanded and made more accessible. The program is targeted at translation of research into industry.
- In light of the recent years, there are no programs that focus on developing health security and the necessary capital infrastructure required. This has been evident in the gaps in our preparedness for vaccine and medicinal responses to the COVID-19 pandemic. Emerging challenges include antimicrobial multidrug resistance and vaccine technologies.

Transition to net zero emissions by 2050

- The NSW net zero innovation grant program is a good initiative; unfortunately it lacks alignment with the Federal schemes, and also lacks scale.

Harnessing new opportunities and managing risks in global value chains

- The on-demand bus trials are a good example; accompanied by a competitive program (or challenge) linked to good ideas to enable clever thinkers to suggest better ways of delivering mobility.
- Education (professional development) through the Certificate of Transport Management (CTM), run at the University's Institute of Transport and Logistics Studies in partnership with TfNSW and BusNSW (now over 28 years), designed to equip industry participants with greater technical skills, managerial skills and a broader awareness of the roles of their sector. This is an excellent example of where education courses break down barriers and enhance cooperation between bus operators, regulators, suppliers and other advisers.
- Work to develop a project ecology that fosters learning across projects has been powerful in other places, enabling lessons learnt documents to be able to be fully shared, embedding innovation programs into major projects, working with universities, investing in modular offsite production (manufacturing approaches) and digitally-enabled product platforms and disseminating best practice.

Agriculture and Agrifood

- The Jobs Plus Program has value, however, the restrictions imbedded in the agreement make it difficult for many companies to benefit (i.e. the timeline for job creation).

13. Could any programs be merged to be more effective, or should any be ceased?

NSW's higher education sector

As above.

Perspectives from our experts

Medical and Life Sciences, medical technologies and pharmaceuticals

- Smaller value programs such as tech vouchers have possibly less impact as the overall pool of funds becomes diluted. It would be helpful to have the data to review.
- Programs in the Skills section of Table A1 (Discussion Paper Appendix, p.31) do not contain any related to health and medical skills. Training should have an 'award' component or option.
- Table A2 programs should not just be about consumers but also include research partnerships and collaborations.
- Programs in the Infrastructure section of Table A5 should have some strategic focus to develop infrastructure that protects the state in case of future crisis, e.g., the manufacture of essential medicines. Comprehensive cool chain logistics for high value medical items that are required as a priority.
- In Table A6, the Boosting Business Innovation Program requires review to assess impact and areas to enhance its impact.

Transition to net zero emissions by 2050

- Green hydrogen is still far from being cost effective for most applications and therefore, funding infrastructure development is premature. Perhaps the NSW Government could identify areas where NSW has a genuine competitive edge?
- There is a need for reevaluation of the entire net zero emissions strategy and how to engage the state expertise including the university sector to facilitate the energy transition.
- There are better ways to support the deployment of electric vehicles than giving rebates and stamp duty exemptions to people who can afford a car that costs up to \$78k; especially as they are also subject to fuel taxes.

Harnessing new opportunities and managing risks in global value chains

- Programs associated with transport, planning and energy are an obvious candidate for better integration.
- There is a need for joined-up thinking and cross-sectoral learning across project-based industries, particularly given the large investments in construction and infrastructure.

14. Are there any actions, or examples of effective practice in other jurisdictions (within Australia or overseas) that the NSW Government should consider to better support economic structural change in NSW industries? Examples might include sector-led initiatives, regulation, or standards to lift productivity and enable more effective competition in global markets.

NSW's higher education sector

As above.

Perspectives from our experts

Medical and Life Sciences, medical technologies and pharmaceuticals

- It is important to note that while the Asian region is an important one, we should ensure that our focus remains global to identify opportunities across a wider geographical footprint. To ensure international competitiveness, there would be benefit in matched funding arrangements with international programs such as the Department of Defence and National Institutes of Health - these are major funding opportunities that can be leveraged.
- We need to ensure that NSW stays competitive in terms of within Australia as well. Melbourne is attracting critical mass through integrated infrastructure and research support programs that embed industry in the higher education sector.

- The Sydney Biomedical Accelerator in Tech Central provides an opportunity for NSW to disrupt this and take a preeminent position.
- There are also good international examples that we can look at as best-practice models e.g., Singapore where this has been successfully implemented and lessons can be learned.
- All the above require significant and strong government support and finance for this to occur.

Transition to net zero emissions by 2050

- There are numerous examples of effective practice and implementable policy for decarbonisation in various sectors. In the US, for example, states like California lead in energy, housing, and transport – as well as in policies that have democratic inclusion and environmental justice at their core.
- The EU approach is a good example of how to invest to shift the economy, with some lessons to be learnt here.
- Another example of effective practice are the feed-in tariffs for biomethane as used in Europe. This needs to be supported by renewable gas certificates - as is being trialled in NSW via GreenPower. Note that it is important that a facility's reported scope 1 emissions are reduced if the facility surrenders the renewable gas certificates.

Harnessing new opportunities and managing risks in global value chains

- Queensland's Department of Transport and Main Roads seems to be leading in the zero-emissions space in transport and mobility with a very astute zero emissions plan.

15. How can the NSW Government generate program outcomes that drive growth and value? How should the NSW Government work to achieve these outcomes with your industry, private sector and other levels of government?

NSW's higher education sector

As above.

Perspectives from our experts

Medical and Life Sciences, medical technologies and pharmaceuticals

- As smaller programs are likely to only yield incremental change, we suggest that the NSW Government aim for greater scale in program outcomes. We note here that major creation of capability - e.g. mRNA manufacturing capability - requires substantial investment and support both for infrastructure, training and research leadership by necessity needs to be greater.
- There could also be a focus on:
 - Transformational programs that are not impacted by changes of government.
 - Programs needing to have an international link.
 - Scales of economy that are needed to ensure competitiveness.
 - Access to capital.
- There also needs to be a larger scale State-based fund available - similar to the Commonwealth's Medical Research Future Fund (MRFF) - that will drive long-term strategic initiatives.

Transition to net zero emissions by 2050

- There could be greater engagement between government and the higher education sector. We could work together to define an energy transition strategy and universities could be communicating more with government agencies about educational opportunities and training. At the University of Sydney, for example, we could easily run short courses including ones that illustrate best practice decarbonisation policies, transition and adaptation planning, and just pathways for transformations.

Harnessing new opportunities and managing risks in global value chains

- The government could establish clearly defined, enduring policy settings. An example of a major issue is financial support from government in refurbishing depots of bus operators in the private sector operating out of government owned depots, conversely, with no clarity for privately owned depots used by contracted bus operators. Both the Sydney Policy Lab and

the James Martin Institute for Public Policy have access to academic and professional staff with the knowledge base to provide government with policy advice in areas of need, for example, zero emissions in transport.

Agriculture and Agrifood

- The NSW Government could assist by:
 1. defining a coordinated agricultural focus and delivery pathway that will fulfil a specific outcome for NSW
 2. enabling the industry through financial opportunity to invest and leverage resources to create new infrastructure and capabilities
 3. working with universities to build a state-wide R&D framework to maximise Federal Government co-contributions and set goals that are state based (expecting that most NSW universities are on their own in developing real capabilities in the agricultural space)
 4. supporting a bridging of the divide between rural/regional actors and metro actors so that capabilities are available to all geographies in a seamless way.