

RANDWICK HEALTH & INNOVATION PRECINCT

ECONOMIC ANALYSIS

SUMMARY REPORT

SEPTEMBER 2021



RANDWICK HEALTH &
INNOVATION PRECINCT

The future of lifelong health



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SGS Economics and Planning Pty Ltd

ACN 007 437 729

www.sgsep.com.au

OFFICES IN CANBERRA, HOBART, MELBOURNE, AND SYDNEY, ON NGUNNAWAL, MUWININA, WURUNDJERI, AND GADIGAL COUNTRY.



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1. Executive Summary

1.1 PRECINCT PROFILE

The Randwick Health & Innovation Precinct (RHIP) comprises a number of established health and education assets with both national and global recognition. Collectively, the RHIP delivers care across a patient's lifespan *'from preconception to the complex health needs of the elderly, from primary to quaternary acute care – all in the one location'*¹. The wide range of health services, education providers and Medical Research Institutes (MRIs) available reflect the complexity and capacity of the RHIP to grow as a leading health and innovation precinct within the Greater Sydney context, building on its critical mass of institutions, pathways and partnerships to *'accelerate the translation of research across all disciplines into new approaches in patient care'*².

Successful innovation precincts offer high levels of amenity and also have good access to a highly skilled and specialised workforce. The RHIP meets both conditions. Located in the Eastern City District within Greater Sydney, it is close to major infrastructure and assets. These features increase the RHIP's ability to attract talent from around the world. The Randwick area is also surrounded by deep pools of highly skilled labour and firms.

As part of Sydney's Eastern City District, the RHIP will contribute to the Greater Sydney Commission's vision for the District to become *'more innovative and globally competitive, carving out a greater portion of knowledge intensive jobs from the Asia Pacific Region'*³. The RHIP is also part of the Eastern Economic Corridor that stretches

across Greater Sydney and is one of several identified Health and Education Precincts that together will support a significant number of jobs and contribute to Sydney's collective competitive advantage in health, education, research and innovation⁴.

The RHIP has four identified areas of health care and research that are existing strengths and areas where it aspires to lead:

- Children's cancer
- Neuroscience, mental health, drug and addiction
- Virtual Health
- Personalised Medicine (Genomics and Genetics).

These 'strengths' will provide a strong foundation and a competitive advantage as the RHIP develops.

The RHIP operates in a competitive but also complementary regional and national environment for health and innovation. Traditionally, these precincts are often thought of as competitors for funding, commercial partnerships and MRI attraction. In practice, each of these precincts have specialised strengths and unique cluster characteristics that should be recognised and should guide where investment for certain infrastructure, services or partners is best suited. Combined, this approach can then position Greater Sydney as a metropolitan centre of health and innovation excellence that results from its deep network of inter-connected but specialised health and education precincts.

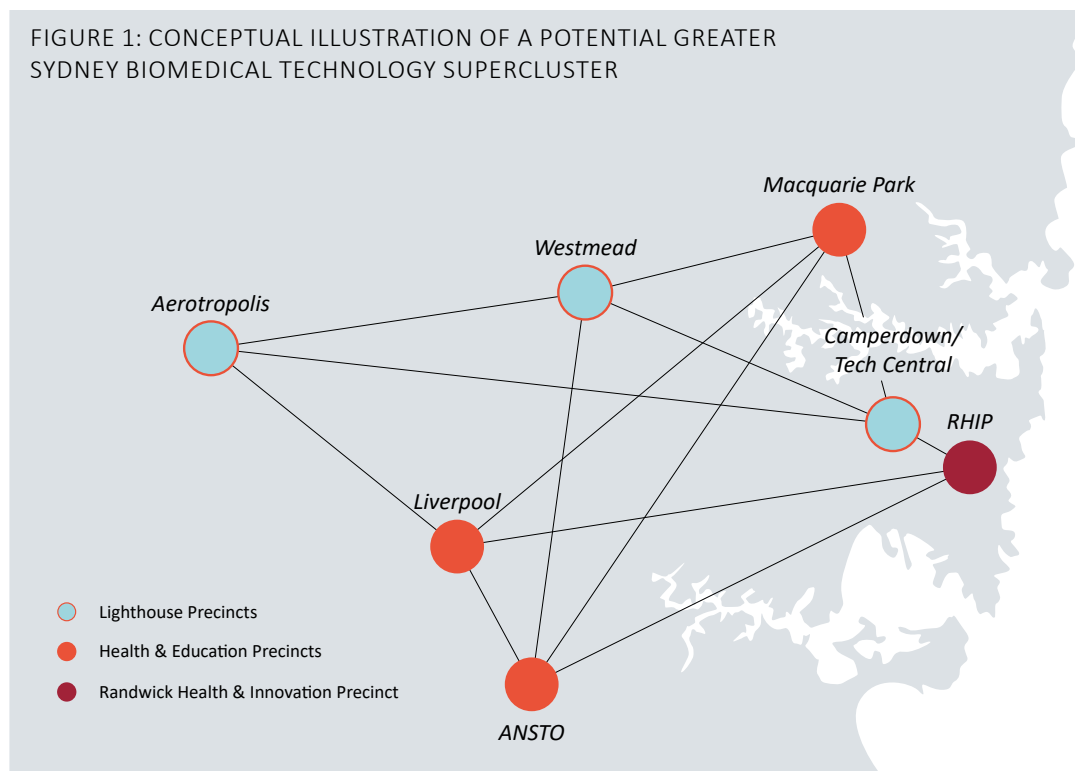
¹ RHIP, 2021

² RHIP, 2021

³ Greater Sydney Commission, 2018

⁴ Eastern Economic Corridor and Health & Education Precincts as identified in the Greater Sydney Commission's strategic plans, 2018

FIGURE 1: CONCEPTUAL ILLUSTRATION OF A POTENTIAL GREATER SYDNEY BIOMEDICAL TECHNOLOGY SUPERCLUSTER



Source: SGS, 2021

1.2 ECONOMIC IMPACT FRAMEWORK

The RHIP directly stimulates the NSW economy through:

- Capital investment (buildings for office, labs and healthcare)
- Service delivery expenditures (health and education)
- Research expenditures (expenses to develop, design, and test products & services)
- Commercial tenant income generation (start-ups and medtech companies locating at site).

Direct economic impacts then generate indirect economic impacts:

- Labour force skills development
- Labour force health improvements
- Research translation
- International student expenditures.

Both the direct and indirect economic impacts also permeate through value chain linkages. Some economic impacts evolve over several years. An economic impact framework was applied to a Base Case scenario

and Uplift scenario for the RHIP to understand its potential contribution to location, regional and national economies.

1.3 BASE CASE SCENARIO RESULTS

Base case modelling indicates:

- The RHIP generates very large contributions to Greater Sydney's Gross Regional Product (GRP)⁵. Estimated to rise from \$4.7B in 2021 to \$7.7B per annum in 2040 with approximately 30,000 Full Time Equivalent (FTE)⁶ jobs supported throughout the 19-year period (2021-2040).
- For NSW's Gross State Product (GSP)⁷, the results are similar. The RHIP supports approximately \$6.1B in 2021 and is estimated to rise to \$9B by 2040 with approximately 35,000 FTE jobs.
- The RHIP provides a significant contribution to Australia's Gross Domestic Product (GDP)⁸, estimated to rise from \$9B in 2021 to \$11.6B in 2040. Employment levels are not materially impacted⁹.

⁵ Gross Regional Product is the measure of size or net wealth generated by a local economy. It is the equivalent of Gross Domestic Product but for a smaller area (economy.id)

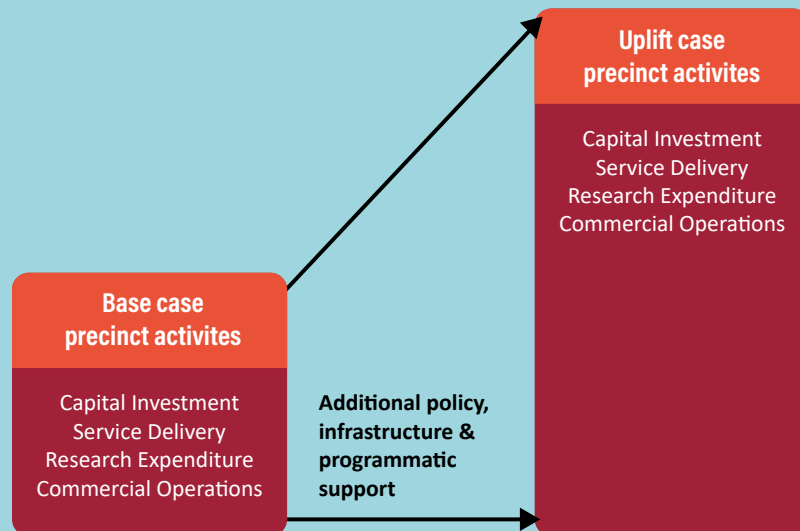
⁶ Full Time Equivalent is defined as a job where a person usually works 35 hours or more a week, and those who usually work less than 35 hours a week, work 35 hours or more in the reference week (Australian Bureau of Statistics)

⁷ Gross State Product is the measure of size or net wealth generated by a state economy

⁸ Gross Domestic Product is the measure of the nation's wealth which is generated by businesses, organisations and individuals working in an area (economy.id)

⁹ As the economic modelling assumes there are national level labour market constraints. While Australia's employment does not grow, real wage levels earned by Australian workers do

FIGURE 2: MOVING FROM 'BASE CASE' TO 'UPLIFT' SCENARIOS AT THE RHIP



Source: SGS, 2021

1.4 OPPORTUNITIES TO ENHANCE THE BASE CASE

In essence, the modelling logic is that additional policy, infrastructure and programmatic support for RHIP will enable it to increase and improve the activities accommodated within the Precinct. That is, if additional support eventuates, then the Precinct will be able to accommodate more capital investment and workers, which in turn will enable more (and better) health and education services, research and commercial production activities to take place on site.

So, what are the opportunities?

To realise the ambition of the RHIP, more will be required than just having a collection of research, education and innovation entities within one place. Creating a successful health and innovation precinct requires a deep and consistent interaction between the entities and their activities, as well as meeting a number of spatial, economic and relational factors:

- Quality of place
- Diversity and inclusion
- Affordability
- Critical mass
- Infrastructure
- Accessibility
- Anchor institutions
- Competitive advantage
- Collaboration.

Drawing together these innovation precinct success factors alongside action areas to help grow the RHIP (as identified by RHIP stakeholders) the following top ten opportunity areas have been identified for the Precinct to action.

1. **Evolve governance:** ensure there is a cohesive vision, strong value proposition, clarity with partnerships, unified branding and seamless leadership, commitment and organisation supporting the Precinct. *Related to Competitive Advantage and Collaboration success factors for innovation precincts.*
2. **Leverage the competitive offer:** The RHIP already has a unique mix of existing healthcare providers, a top tier education institution and high-quality research entities. It is also located in an attractive part of Greater Sydney that is close to diverse local communities, major infrastructure and natural assets. Use these features to attract future workers, researchers and students. *Related to Quality of Place and Competitive Advantage success factors for innovation precincts.*
3. **Actively encourage collaboration:** If the RHIP is to be successful, and for innovation to be produced, there must be an exchange of problems, ideas and solutions between the people working, researching and studying at the Precinct. *Related to Collaboration and Anchor Institutions success factors for innovation precincts.*
4. **Take the 'strengths' to the next level:** Use the four identified 'strengths' to attract investment. Find the specific niches within the strengths that the RHIP can excel at, and overtime consider other existing strengths that could be leveraged, such as biomedical engineering, or new strengths that may emerge. *Related to Diversity and Inclusion, and Competitive Advantage success factors for innovation precincts.*

5. **Target a range of entities:** Start-ups, biotech and medtech companies, the existing nine MRIs, centres of excellence, other academic partners and businesses development/support units will all find value in the RHIP. *Related to Diversity and Inclusion, Critical Mass and Anchor Institutions success factors for innovation precincts.*
6. **Provide both the ‘hard’ and ‘soft’ infrastructure:** Remember it is the people and their exchange of ideas that provide the innovations. Invest in the people and their skills, training, interactions and learning, as well as the physical built form. Secure additional infrastructure investment. *Related to Quality of Place, Critical Mass, Infrastructure, Collaboration and Accessibility success factors for innovation precincts.*
7. **Flexibility and affordability will be a key consideration:** Flexible floorspace, flexible leasing arrangements, and support for newer, flexible working arrangements (between office and home) will be a requirement in the RHIP. Importantly, people will also have to be flexible in their expectations – willing to accept risk and understanding that long-term investment is required. Affordable floorspace for start-ups and businesses, and affordable short-term and long-term accommodation options will be important to attract workers, students, patients and their families to work and engage with the Precinct. *Related to Affordability, and Diversity and Inclusion success factors for innovation precincts.*
8. **Simplify the systems:** Simplify the multiple systems that workers at the RHIP operate under and reduce restrictive regulations. Provide better guidance, digitally and in-person, for patients navigating the healthcare system and consider systems for fund-sharing and data sharing. *Related to Quality of Place success factors for innovation precincts.*
9. **Engage with the world outside the Precinct boundary:** Consider how the local community could get involved in the RHIP. Consider how the surrounding local area can support healthcare and research operations that do not necessarily have to be located at site. Advocate for a local town centre that supports the needs of workers, student, patients and their families. Regionally, link into the ‘Eastern Economic Corridor’ that runs across Sydney and ensure the RHIP complements, rather than competes, with the growing health, education and innovation network across Greater Sydney. Nationally, work to attract international talent to overcome Australia’s distance and small market of workers. *Related to Quality of Place, Critical Mass, Accessibility and Collaboration success factors for innovation precincts.*





10. Evolve the measures of success: For innovation precincts, measures of success also account for wealth, type of student enrolments, and level of research and development translation. Other benefits could also be the jobs created; the infrastructure that is developed; the impact and growth of surrounding businesses; the attraction of new businesses; and the ability of the innovation ecosystem (internal and external) to create new products. *Related to Competitive Advantage success factors for innovation precincts.*

1.5 UPLIFT SCENARIO RESULTS

If the above opportunities are met, it is assumed the RHIP will achieve the Uplift scenario that enables more employment, service delivery (health and education), research and commercial tenant activities on site. Uplift is assumed to commence in 2026 and gradually increases until the RHIP accommodates 20% more activity by 2040.

By 2040, under the Uplift scenario, the RHIP is estimated to contribute:

- \$8.8B to Greater Sydney's Gross Regional Product
- \$10.4B to NSW's Gross State Product
- \$12.6B to Australia's Gross Domestic Product

- 37,000 Full Time Equivalent jobs for Greater Sydney
- 43,000 Full Time Equivalent jobs for NSW (includes the 37,000 Greater Sydney jobs)
- Real wage improvements at the national level.

1.6 CONCLUSION

The RHIP has a significant number of existing strengths and assets upon which to build a globally recognised health and innovation precinct. Realising this ambition is likely to increase its economic impact above what it would otherwise achieve. To do so will require concerted and sustained investment in, and curation of the Precinct, over the long term to ensure that not only does it attract the private sector businesses, students and other actors required to make it globally successful, but that it has active collaboration opportunities and programmatic structures in place to ensure the benefits of co-location and knowledge sharing are maximised.

2. Precinct Profile

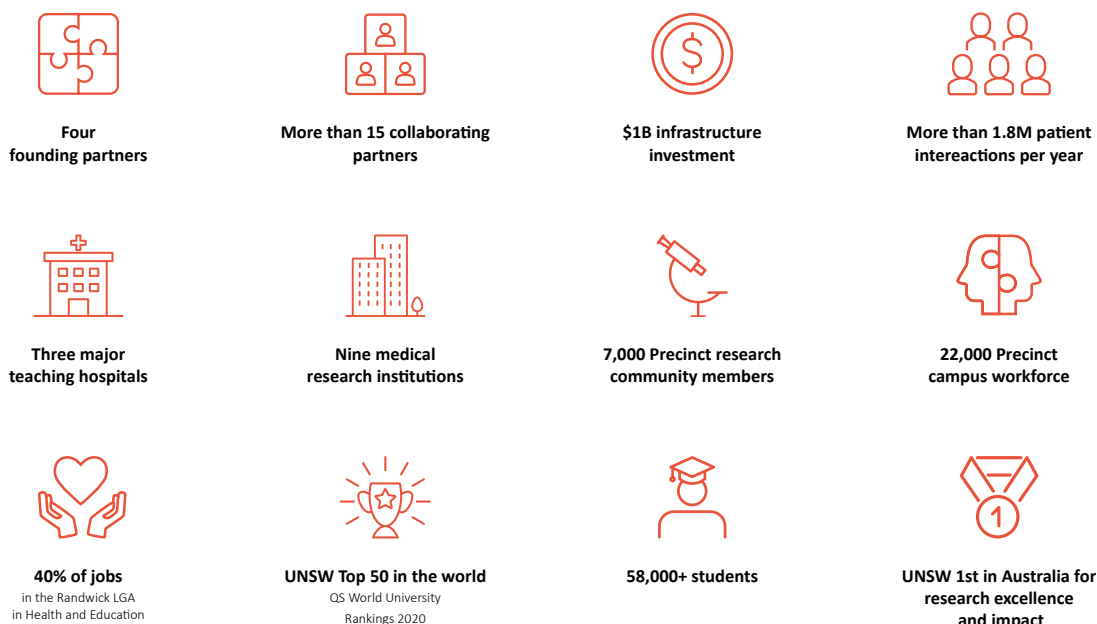
2.1 A PRECINCT WITH SIGNIFICANT RESEARCH AND INNOVATION ASSETS

The Randwick Health & Innovation Precinct (RHIP) comprises a number of established health and education assets with both national and global recognition. The hospital cluster includes the nationally recognised hospitals of the Prince of Wales, Sydney Children's Hospital, and the Royal Hospital for Women. The RHIP also accommodates nine active Medical Research Institutes (MRIs) that attract global recognition in the areas of children's cancer, neuroscience, mental health, drug and addiction. The University of NSW (UNSW) is

part of the Group of 8 - Australia's leading research intensive universities.

Collectively, the RHIP delivers care across a patient's lifespan 'from preconception to the complex health needs of the elderly, from primary to quaternary acute care – all in the one location'¹⁰. The wide range of health services, education providers and MRIs available reflect the complexity and capacity of the RHIP to grow as a leading health and innovation precinct within the Greater Sydney context, building on its critical mass of institutions, pathways and partnerships to 'accelerate the translation of research across all disciplines into new approaches in patient care'¹¹.

FIGURE 3: KEY ASSETS AND CONTRIBUTORS TO THE RHIP



Source: RHIP, 2021

¹⁰ RHIP, 2021

¹¹ RHIP, 2021

2.2 A STRATEGICALLY LOCATED PRECINCT

Successful innovation precincts offer high levels of amenity and also have good access to a highly skilled and specialised workforce. The RHIP meets both conditions. Located in the Eastern City District within Greater Sydney, it is within close proximity to major infrastructure and assets including the Sydney CBD approximately eight kilometres away, Sydney Kingsford Smith Airport approximately seven kilometres away, and also the Eastern Suburb beaches and major open space, such as Centennial Park. These features increase the RHIP's ability to attract talent from around the world. The Randwick area is also surrounded by deep pools of highly skilled labour and firms.

The RHIP is an important component of Sydney's Eastern City District and the Eastern Economic Corridor that stretches from Sydney Airport and Botany Bay, through to Green Square, Randwick, the CBD, Chatswood and Macquarie Park in the north-west. The Greater Sydney Commission's vision for the Eastern City District is to become 'more innovative and globally competitive, carving out a greater portion of knowledge intensive jobs from the Asia Pacific Region'¹². The RHIP is also one of several identified Health and Education Precincts across Greater Sydney that together will support a significant number of jobs and contribute to Sydney's collective competitive advantage in health, education, research and innovation¹³.

2.3 A PRECINCT WITH EXISTING STRENGTHS AND ASPIRATIONS

The RHIP has four identified areas of health care and research that are existing strengths and areas where it aspires to lead. These areas of healthcare will provide a strong foundation and a competitive advantage as the RHIP develops:

Children's cancer: The RHIP has a strong presence in paediatrics, adolescent medicine and surgery and is home to the Sydney Children's Hospital Randwick, as well as the Royal Hospital for Women. The Children's Cancer Institute and the Kids Cancer Centre are also situated within the Precinct. The Children's Cancer Institute supports the work of over 300 researchers, operational staff, and students with a broad range of research areas from gene regulation in cancer to translational cancer nanomedicine. The Kid Cancer Centre investigates possible oncological disorders.

Neuroscience, mental health, drug and addiction:

The RHIP is home to several MRIs specialising in neuroscience, mental health, drug and addiction research. A number of these MRI's are founding partners of the Mindgardens Neuroscience Network, including the Black Dog Institute, and Neuroscience Research Australia (NeuRA). The first stage of the Mindgardens Neuroscience Network is Commonwealth Government funded at \$7 million. Foundational projects are due for completion in 2021. Future project phases will bring treatment and research for a complete spectrum of neurological and neurodegenerative disorders within the integrated model it has developed for mental health, suicide prevention and substance use.

Virtual Health: There are several MRIs at the RHIP which are investigating virtual health and advanced digital health solutions. The Centre for Big Data Research in Health is the first Australian research centre dedicated to health using big data. This Centre aims to 'maximise the productive use of all possible sources of health big data to enhance the health and wellbeing of Australians and the global community'¹⁴.

Personalised Medicine (Genomics and Genetics):

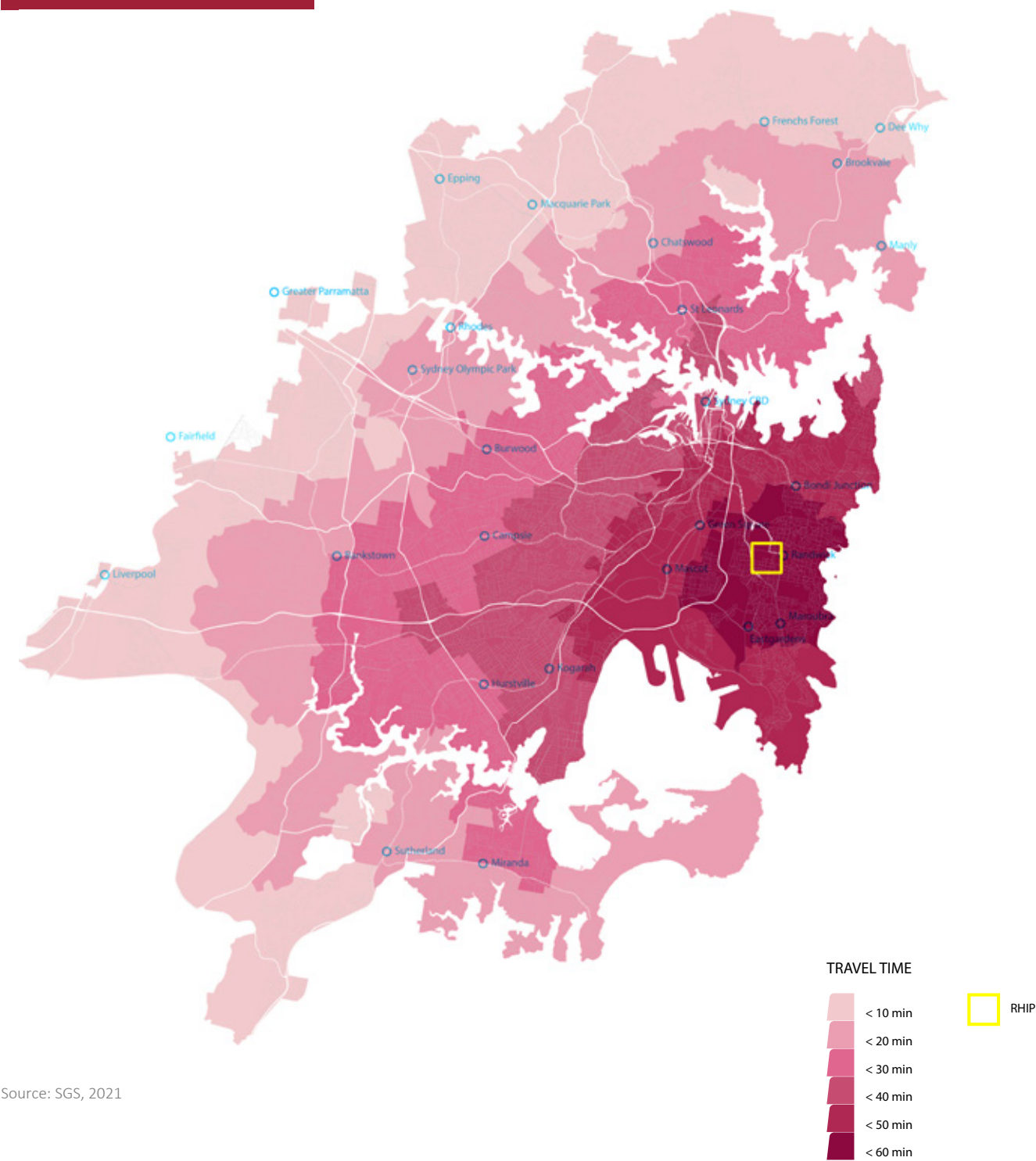
The UNSW School of Biotechnology and Biomolecular Sciences is focused on enabling medical breakthroughs and clinical application with cutting edge computational biology. The School is home to the Ramaciotti Centre, the largest genomics facility at any Australian University. It offers a broad range of genomic analysis services and is equipped with the latest next-generation sequencing technology, single cell genomics platforms and high throughput microarray systems. The Centre aspires to be a key leader in genomic data to extract meaningful results and to disseminate new discoveries and approaches to healthcare, therapy, and drug discovery.

¹² Greater Sydney Commission, 2018

¹³ Eastern Economic Corridor and Health & Education Precincts as identified in the Greater Sydney Commission's strategic plans, 2018

FIGURE 4: TRAVEL TIMES FROM RHIP VIA PRIVATE TRANSPORT

“Successful innovation precincts offer high levels of amenity and also have good access to a highly skilled and specialised workforce”

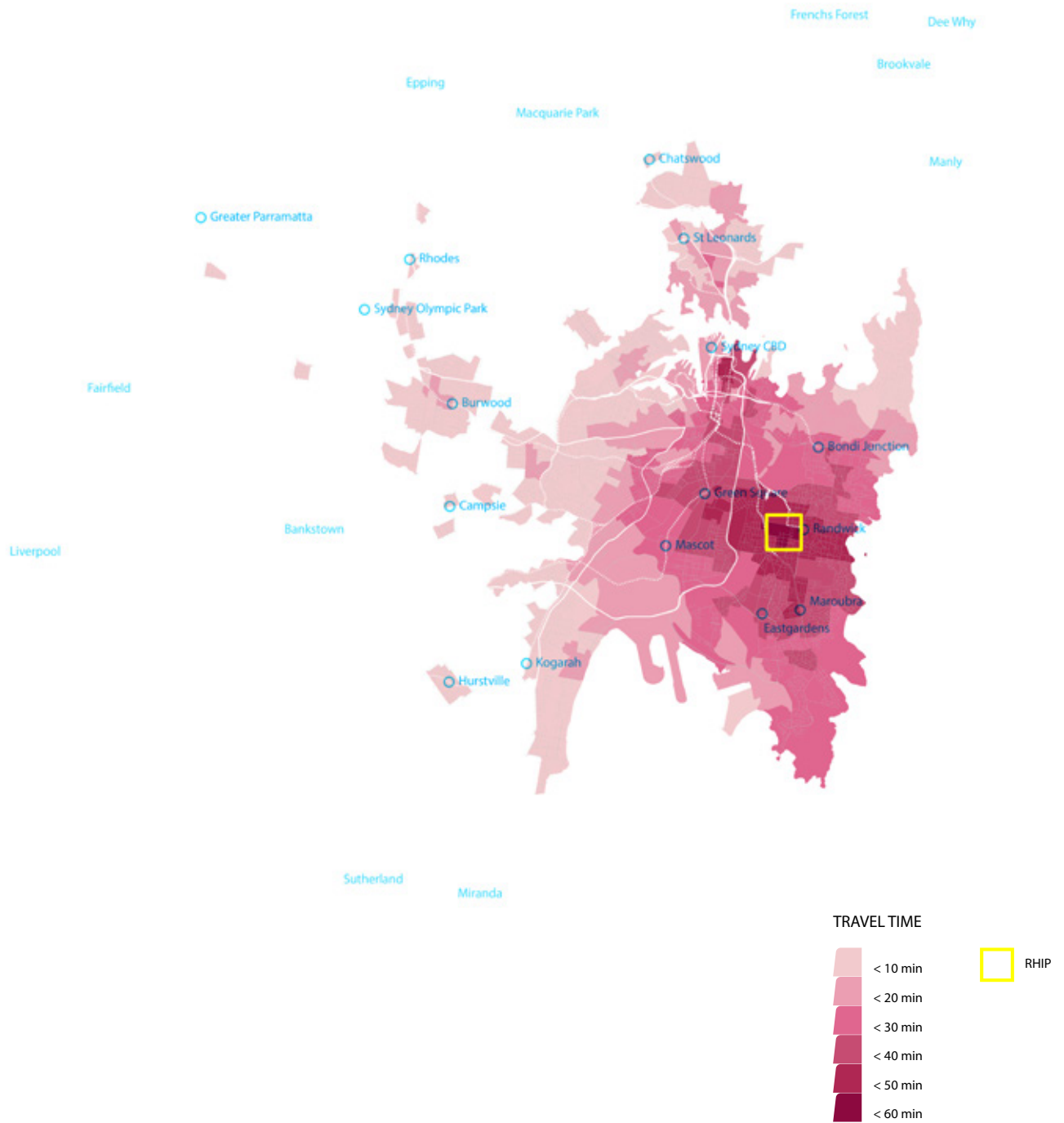


Source: SGS, 2021

¹⁴ CBDHR, 2021

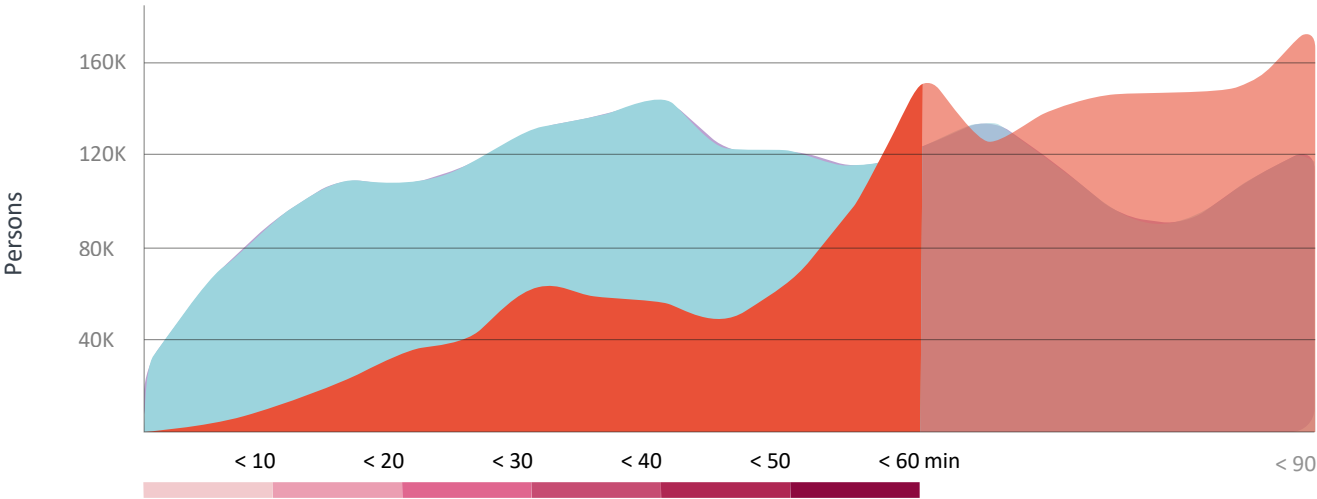
FIGURE 5: TRAVEL TIMES FROM THE RHIP VIA PUBLIC TRANSPORT

“The Randwick area is also surrounded by deep pools of highly skilled labour and firms”



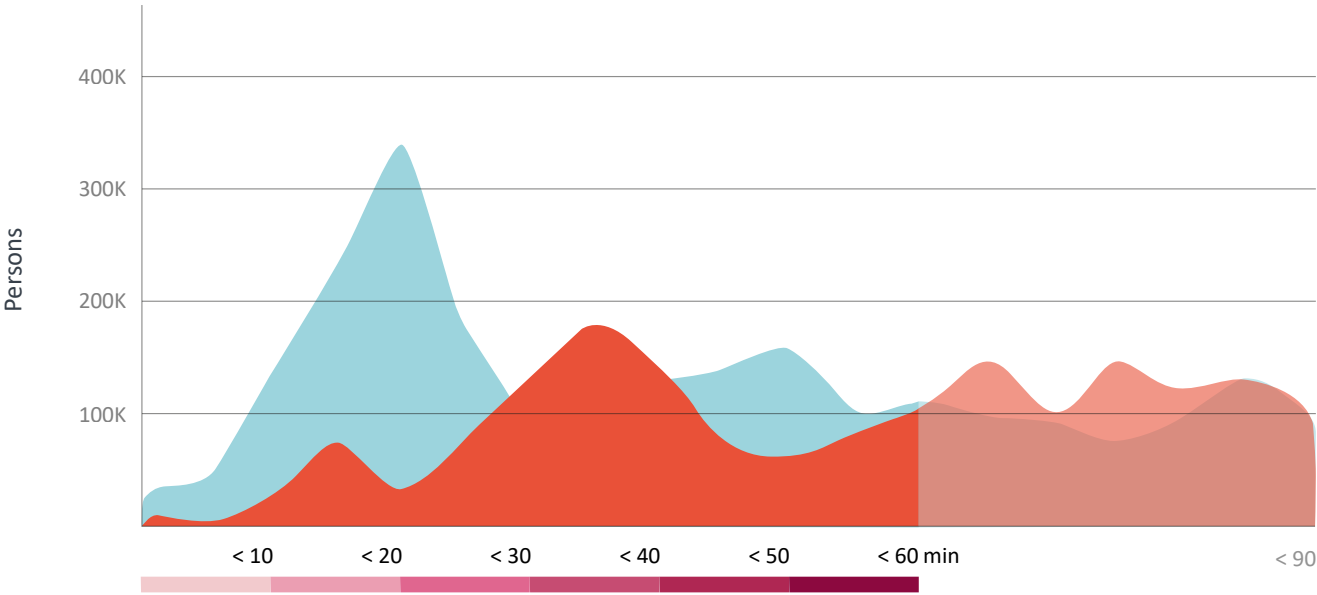
Source: SGS, 2021

FIGURE 6: LABOUR FORCE CATCHMENT FROM THE RHIP (PLACE OF USUAL RESIDENCE)

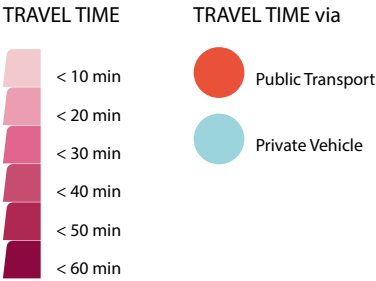


Source: SGS, 2021

FIGURE 7: EMPLOYMENT CATCHMENT FROM THE RHIP (PLACE OF WORK)



Source: SGS, 2021



2.4 A NETWORK OF PRECINCTS

The RHIP operates in a competitive but also complementary regional and national environment. Across Greater Sydney, there are several major health and education precincts that accommodate a similar mix of health services, education institutions, research facilities and corporate partners. These health and education precincts are often located in different Local Health Districts that are responsible for healthcare delivery.

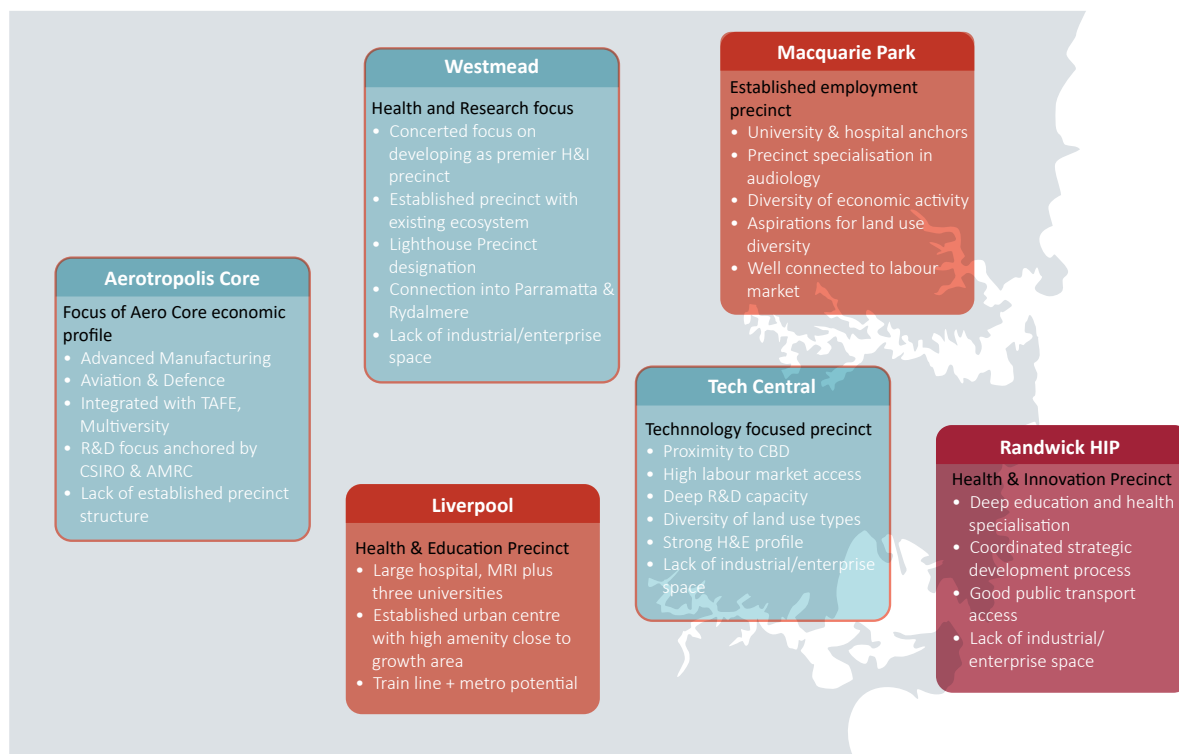
Traditionally, these precincts are often thought of as competitors for funding, commercial partnerships and MRI attraction. In practice, each of these precincts have specialised strengths and unique cluster characteristics that should be recognised and should guide where investment for certain infrastructure, services or partners is best suited. Combined, this approach can then position Greater Sydney as a metropolitan centre of health and innovation excellence that results from its deep network of inter-connected but specialised health and education precincts.

In recent years, health precincts have been noted as key economic anchors in strategic planning across Greater Sydney. This has manifested in the identification of three 'Lighthouse Precinct's by the NSW Government to align with the Three Cities Framework that is used to define Greater Sydney's economic geography:

- The Eastern City has the Tech Central Lighthouse Precinct. Located around Central Station but extending across to the Camperdown Health and Education Precinct. The RHIP is located in the Eastern City.
- The Central City has the Westmead Health Precinct as its Lighthouse Precinct.
- The Western Parkland City has the Aerotropolis Core as its Lighthouse Precinct.

While the Randwick Precinct has not been designated a Lighthouse Precinct, it has an important role where it can link to the Tech Central Lighthouse Precinct through its own specialised research, services and economic connections into the wider Eastern City. It is important that the RHIP sees its role more in terms of complementing and value-adding to a wider health and innovation network than competing with these other precincts for investment attraction¹⁵.

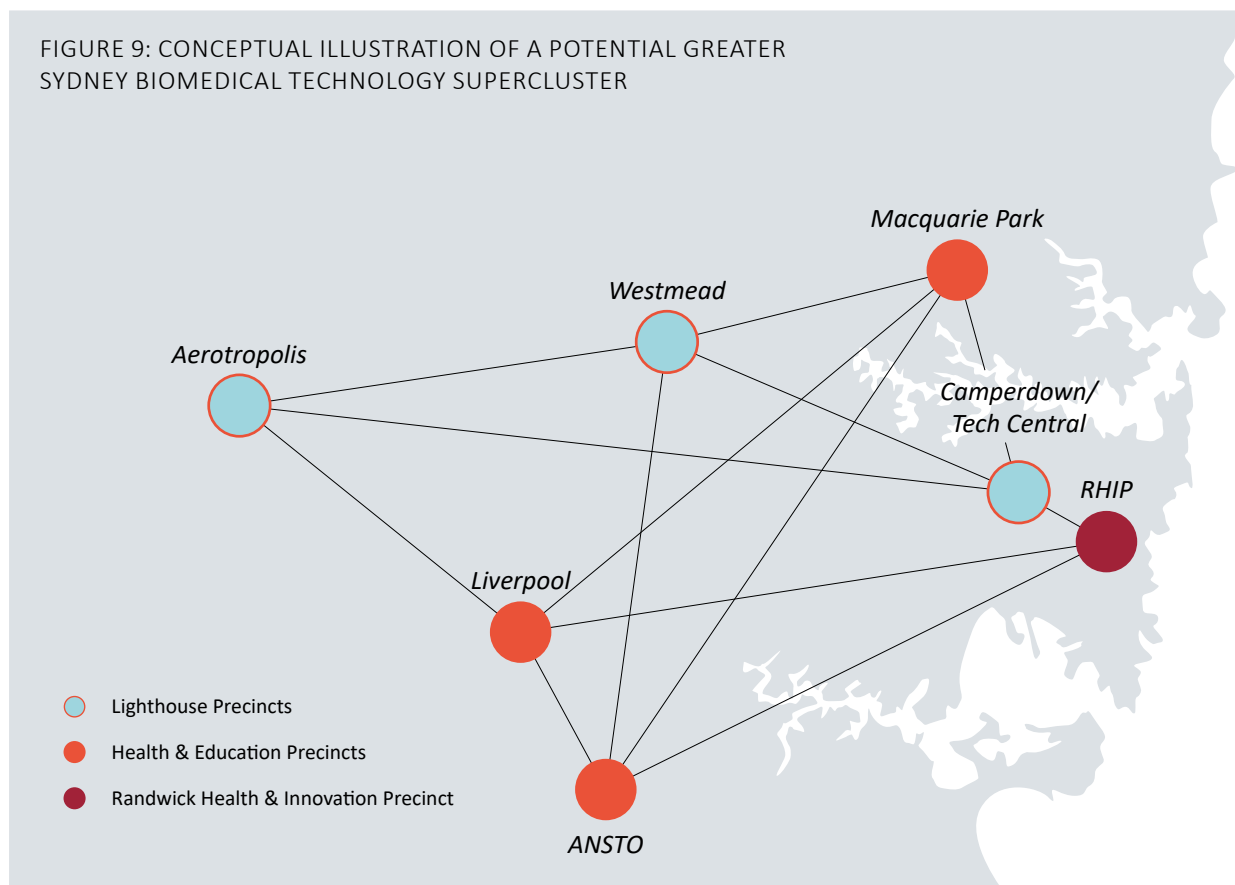
FIGURE 8: SUMMARY OF GREATER SYDNEY'S KEY HEALTH, EDUCATION AND INNOVATION NETWORK



Source: SGS, 2021

¹⁵ See Appendix B for a comparison of the Randwick Precinct against the three Lighthouse Precincts in relation to vision, scale and complexity of functions.

FIGURE 9: CONCEPTUAL ILLUSTRATION OF A POTENTIAL GREATER SYDNEY BIOMEDICAL TECHNOLOGY SUPERCLUSTER



Source: SGS, 2021

All of Greater Sydney's Lighthouse Precincts have clear current or intended areas of strength across health, innovation and other sectors. It is also evident that no one precinct can, or should do it all, as this would undermine other precincts (including those not considered Lighthouse Precincts).

The RHIP will need to take a more strategic view on its role in the much larger Greater Sydney biomedical vision where both the RHIP and the Tech Central Lighthouse Precinct act as the eastern anchor to a Greater Sydney bio and medical technologies super cluster. It would also include Randwick leveraging and focusing on its targeted specialisations across children's cancer; neuroscience,

mental health, drug and addiction; virtual health; and personalised medicine (genomics and genetics). This would be supported by the RHIP's unmatched cluster of hospitals and the primary campus of the globally-recognised UNSW with a variety of faculties able to contribute to research and innovation, as well as its multiple MRIs.

3. Success factors for innovation precincts

3.1 INNOVATION PRECINCT SUCCESS FACTORS

To realise the ambition of the RHIP, more will be required than just having a collection of research, education and innovation entities within a place. Creating a successful health and innovation precinct requires a deep and consistent interaction between the entities and their activities, as well as meeting a number of spatial, economic and relational factors. On the next page are

nine factors often associated with successful, global innovation precincts. Ensuring these are met at the RHIP would assist in its development and success. To see how other domestic and international innovation precincts perform against the nine factors see Appendix A.



BUILDING A SUCCESSFUL INNOVATION PRECINCT

FIGURE 10: BUILDING A SUCCESSFUL INNOVATION PRECINCT



Source: SGS Economics and Planning

4. Opportunities

From April to June 2021, 29 participants were interviewed about the future potential of the RHIP and the catalyst interventions and opportunity areas that would be required to make it a successful health and innovation precinct. Most participants were stakeholders closely involved in the RHIP and working in industry. Stakeholders are involved in a range of relevant sectors including healthcare provision, medical research, government, education, investment attraction and the biotech industry.

Below are the top 10 opportunity areas that need to be established and nurtured to help make the RHIP a success, as identified by these stakeholders. The relationship of these opportunity areas to the nine success factors for innovation precincts (see Chapter 3) has also been identified.

If these 10 opportunity areas and success factors are established and nurtured at the RHIP, it is expected that the social and economic impact of the RHIP will uplift and contribute towards a healthier society, more innovative domestic research and capabilities, and a stronger, more productive economy for Greater Sydney and beyond.

1. Evolve governance: Ensure there is a cohesive vision, strong value proposition, clarity with partnerships, unified branding and seamless leadership, commitment and organisation supporting it. Ensure the structure and processes of the RHIP are designed so that there is stability, equity, broad-based participation and transparency.

Related to the following success factors for innovation precincts:



**Competitive
Advantage**



Collaboration

Big moves forward: In 2017, one of the RHIP's early achievements was the establishment of a governance framework. Keeping in line with the growing depth of operations, the RHIP governance framework developed and now includes the Precinct Council, Executive Precinct Committee, Precinct Collaboration Committee, and 11 working groups that help to identify issues, risks and opportunities.

As the RHIP evolves, so will the governance framework. Analysis completed for the RHIP indicates consideration should be given to tailoring the operational model to a formal structure such as an incorporated entity at the appropriate time; establishing a contributions framework for the participants; and identifying ways to streamline decision-making powers and implementation of day-to-day activities.

Updates to the Randwick Collaboration Agreement could include a clear and aligned vision statement, formalised governance structure, funding mechanism, review and feedback, flexibility to accommodate growth, ensuring intellectual property and confidentiality, moving to a more legal/contractual structure. Longer term updates could relate to an operating entity, and contribution framework.

(Source: NSW Health Precinct Strategy Governance, the Randwick case study and a new Collaboration Agreement, 2021)

2. Leverage the competitive offer: The RHIP already has a unique mix of existing healthcare providers, a top tier education institution and high-quality research entities. It is also located in a highly desirable part of Greater Sydney that is attractive, close to diverse local communities, major infrastructure and natural assets. Use these features to attract future workers, researchers and students.

Related to the following success factors for innovation precincts:



Competitive Advantage



Quality of Place

3. Actively encourage collaboration: There are many entrenched ‘silos’ throughout the health industry. Mindset and culture can be slow to change. If the RHIP is to be successful, and for innovation to be produced, there must be an exchange of problems, ideas and solutions between the people working, researching and studying at the Precinct. Cross-fertilisation of specialisations and collaboration between the various entities (clinicians, innovators, researchers, business support units, industry, public and private healthcare systems) has to be actively encouraged, and easily facilitated via programs, events, networks, data sharing and the built form.

Related to the following success factors for innovation precincts:



Collaboration



Anchor Institutions

4. Take the ‘strengths’ to the next level: Use the four identified ‘strengths’ to attract investment – children’s cancer research at Randwick is world leading; neuroscience and mental health has a strong basis from which to grow; virtual care is relevant to all areas of research and medicine; while there is ambition in the genomics and genetics space. Find the specific niches within the strengths that the RHIP can excel at, and overtime consider other existing strengths that can leveraged, such as biomedical engineering, or new strengths that may emerge.

Related to the following success factors for innovation precincts:



Diversity and Inclusion



Competitive Advantage

5. Target a range of entities: Start-ups are always on the hunt for space to execute their ideas – there is a shortage of ‘hard’ and ‘soft’ infrastructure to help them set-up, and often this leads to their ideas becoming lost. The RHIP will also be an attractive offer to established biotech firms, especially given the close proximity to medical samples, educators, the pipeline of students and patients – seeing patients and their healthcare issues day-to-day can be an encouraging reminder for researchers and innovators about what they are seeking to achieve in their work. For similar reasons, additional MRIs would find the RHIP an attractive place to locate. Other academic partners, mental health support services, and business development units (that can provide the ‘know-how’ to researchers looking to grow their companies and execute the commercialisation process with their products) would also be of value and would fill knowledge and service gaps.

Related to the following success factors for innovation precincts:



Anchor Institutions



Diversity and Inclusion



Critical Mass

Big moves forward: Precinct partners would link into the core research and strengths, skills and capability of the RHIP and help progress the commercialisation process. Partners could be located on-site or elsewhere in Greater Sydney linking eastern and western Sydney.

6. Provide both the ‘hard’ and ‘soft’ infrastructure:

Ensure there are well-designed buildings and a pleasant campus. A mixture of labs, technical facilities, office and shared meeting spaces will be required for start-ups, and more established research entities. High quality IT infrastructure and data security will be valued, as well as a data hub and workers that can process the data. Continue to advocate for public transport improvements and consider the need for adequate parking and transport options for vulnerable patients to be able to access the site for healthcare. Public space and multiple eateries will be valued by all, as places to interact and share ideas. The RHIP should reflect the evolution of medicine and healthcare that now encompasses science, technology, virtual care and community-based care. But remember it is the people and their exchange of ideas that provide the innovations – invest in the people and their skills, training and learning, as well as the physical built form.

Related to the following success factors for innovation precincts:



Quality of Place



Critical Mass



Collaboration



Infrastructure



Accessibility

7. Flexibility and affordability will be a key

consideration: Flexible floorspace is often valuable for companies to ensure floorspace meets their changing needs. Flexibility in leasing arrangements can also be favourable, as the size and needs of companies in this field can change quickly. Ways of working are also changing and are becoming more flexible between the traditional workplace and home. The RHIP will need to ensure the physical office at the Precinct and the virtual online office are supported. Overall, people investing in the RHIP will have to be flexible in their expectations – willing to accept risk and understanding that long-term investment is required. Sydney’s eastern suburbs were noted by many stakeholders as being an expensive place to live, work and study. Offering affordable floorspace for start-ups and businesses and ensuring affordable short-term and long-term accommodation options are available for workers, students, patients and their families will be key to attracting a diversity of people to work, use and engage with the Precinct.

Related to the following success factors for innovation precincts:



Diversity and Inclusion



Affordability

8. Simplify the systems: Currently, some workers operate under a number of different human resource and data systems at the RHIP. The different major institutions operate with different databases in ‘silos’. For patients, there can be multiple points in which they ‘enter’ the healthcare system to seek help, which can result in different levels of care. There can be disjuncture when a patient transitions from child to adult care. While the different entities all bid for funding. Simplify the multiple systems and restrictive regulations. Provide better guidance for patients through the healthcare system while they receive treatment (digital and in-person). Consider a triage system that channels appropriate patients towards private services to help reduce pressure on the public system. Consider a system of fundraising, fund-sharing and philanthropy that is streamlined. Address the need for data sharing, as the volume of data will grow.

Related to the following success factors for innovation precincts:



Quality of Place

9. Engage with the world outside the Precinct boundary:

Locally, consider how the community could get involved and contribute to the Precinct – helping to grow buy-in and pride in their local RHIP. Manage expectations and ensure the research and projects make sense to industry and can be delivered in reasonable timeframes. Work with Randwick City Council and link in with their economic development plans - consider how the local area can support healthcare and research operations that don’t necessarily have to be located at site; and continue to advocate for a local town centre that will support the needs of the workers, patients and their families and students. ‘Clever’ community health models need to be developed that are more effective at reaching the local community, while affordable accommodation for visiting patients and their families in the local area is in immediate need. Regionally, link into the ‘Eastern Economic Corridor’ that runs across Sydney and ensure the RHIP complements, rather than competes, with the growing health and innovation network across Greater Sydney. Nationally, work to attract international talent to overcome Australia’s distance and smaller market of workers.

Related to the following success factors for innovation precincts:



Quality of Place



Critical Mass



Collaboration



Accessibility

10. Evolve the measures of success: Publishing papers and measuring immediate steps may be more of a traditional approach. For innovation precincts, measures of success also account for wealth, type of student enrolments, and level of R&D translation. Other benefits could also be the jobs created; the infrastructure that is developed; the impact and growth of surrounding businesses; the attraction of new businesses; and the ability of the innovation ecosystem (internal and external) to create new products.

Related to the following success factors for innovation precincts:



Competitive Advantage

A SNAPSHOT OF SUCCESSFUL PRECINCTS AROUND THE WORLD

What success may look like: With a large university and two major hospitals and supporting up to 26,000 employees, the Gold Coast Health and Knowledge Precinct is estimated to provide approximately \$3 billion to the local Gold Coast economy. (Source: wearegoldcoast.com.au)



What success may look like: The MaRS innovation precinct in downtown Toronto, Canada supports approximately 17,200 employees (2018). As a launchpad for start-ups and a home for innovators, the capital raised by MaRS supported companies is estimated to be about \$6.3 billion and revenue generated about \$4.4B since 2008. (Source: www.marsdd.com)



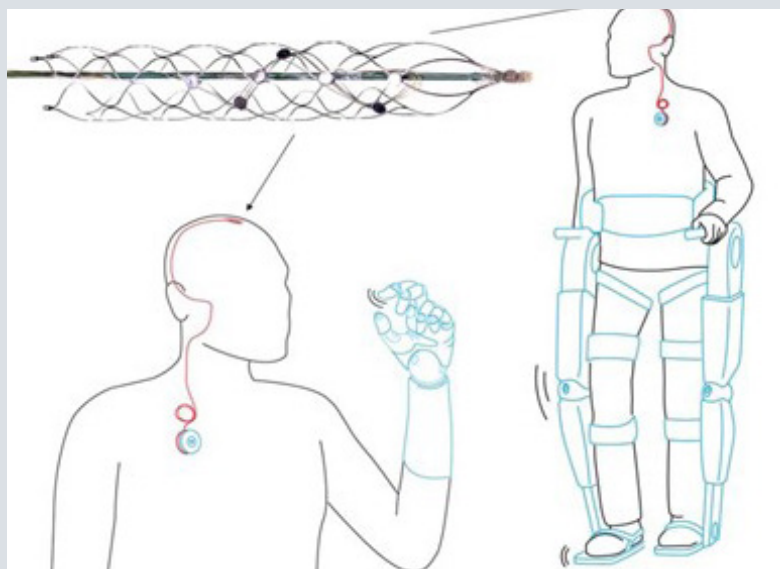
What success may look like: North of the Melbourne's CBD, the Melbourne Biomedical Precinct is a world-renowned biomedical research hub. With 30 precinct partners, employing approximately 28,000 people (including 10,000 researchers), it is estimated the Melbourne Biomedical Precinct contributes A\$3.6 billion to Victoria's gross regional product.

Major achievements coming out the Precinct include the world's first cochlear implant in 1978 at the Eye and Ear Hospital; the first implantable cardioverter defibrillator operation in the southern hemisphere conducted at the Royal Melbourne Hospital; and the Nobel Prize awarded to researchers for discoveries related to specificity of the cell mediated immune defence in 1996 (Source: www.melbournebiomed.com)



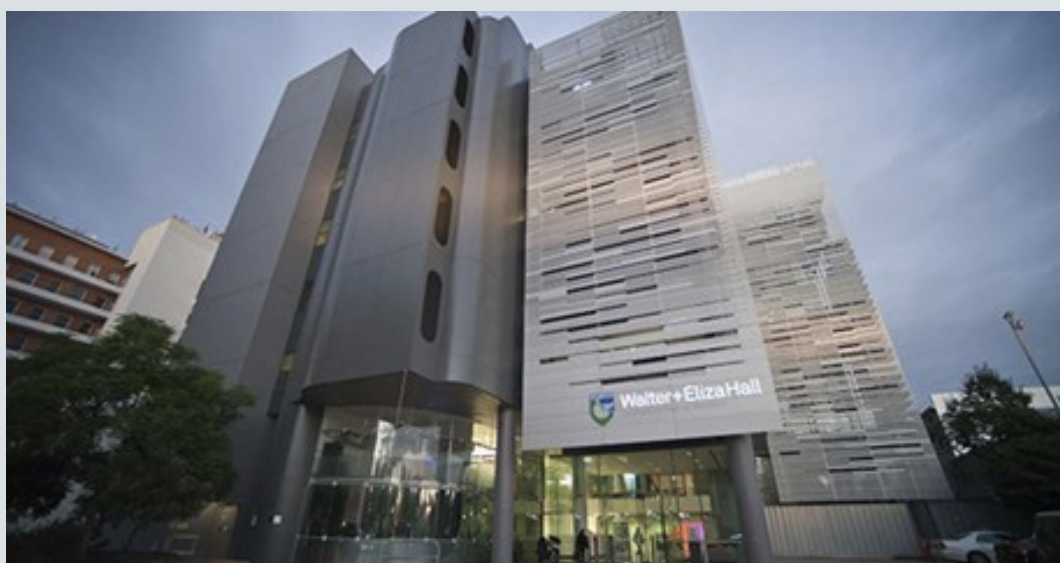
What success may look like: One of the major innovations being developed at Melbourne's Biomedical Precinct is the Stentrode – a matchstick sized device that is implanted in a blood vessel next to the brain's control centre for movement. The Stentrode has the potential to transform the lives of amputees and people with spinal injuries, motor neurone disease and other conditions. It could one day enable people to control robotic limbs and exoskeletons through thought.

Development of the Stentrode has been achieved through the collaboration of a broad range of stakeholders and disciplines involved in the Melbourne Biomedical Precinct, including 39 academic scientists and leaders in medical research at The Royal Melbourne Hospital, The University of Melbourne and the Florey Institute of Neuroscience and Mental Health (Source: www.melbournebiomed.com)



What success may look like: Venetoclax, a novel anti-cancer treatment, was developed at the Walter and Eliza Institute of Medical Research located at Parkville's Melbourne Biomedical Precinct. Venetoclax improves a patients' chances of survival by inhibiting a protein that makes cancer cells in chronic lymphocytic leukaemia patients resistant to other therapies.

In 2017, the Institute sold a portion of the royalty rights for the treatment for an upfront cash payment worth US\$250 million and potential milestone payments up to US\$75 million. Partial royalties were retained by the Institute. The funds were reinvested by the Institute to continue the discovery and translation of medical research. (Source: www.melbournebiomed.com)



5. The economic impact

If the innovation precinct success factors are addressed, and the top 10 opportunities identified by RHIP stakeholders are realised to their full potential, then it is likely the economic impact of the RHIP will increase above a business-as-usual outcome. This chapter summarises the potential economic impacts of realising the 'uplift' potential.

5.1 ECONOMIC IMPACT FRAMEWORK

The RHIP directly stimulates the NSW economy through the capital investment; service delivery (for example, health and education); research and the commercial expenditures it facilitates onsite (i.e. within the RHIP boundaries).

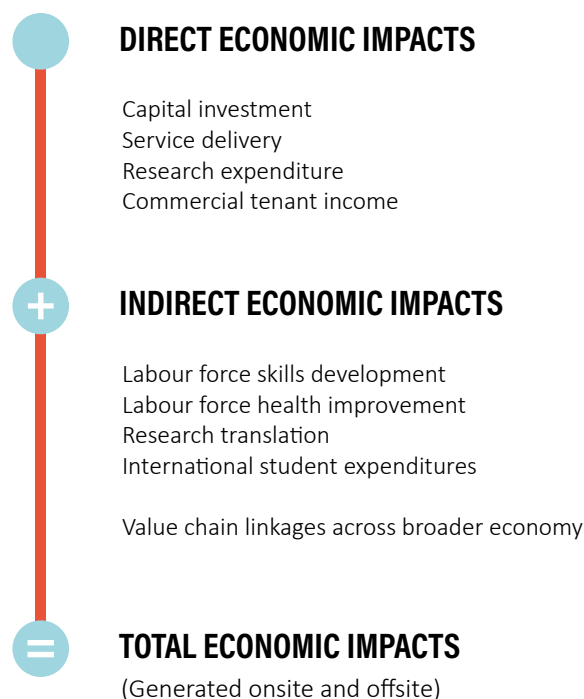
These direct impacts generate indirect economic impacts, both inside and outside of the RHIP's boundaries, through the:

- Improved labour force skills (and therefore productivity) of graduating students
- Improved labour force health (and therefore productivity) of treated patients
- Translation and commercialisation of research undertaken
- Export income earned from international students attracted to Sydney and NSW
- Upstream and downstream transactions that the direct and indirect impacts trigger in the NSW/ Australian economy, i.e. through their respective production and consumption value chains.

Some of these economic impacts evolve over several years. For example, the labour force productivity impacts, linked with skills development and community health, extend over many years, as do the economic impacts linked with research translation. Where this is the case, economic modelling includes impacts stemming from the precinct activities over previous years.

The economic impact framework for the RHIP is depicted in the figure below.

FIGURE 11: RHIP ECONOMIC IMPACT FRAMEWORK



Source: SGS, 2021

5.2 PRECINCT BASE CASE VS UPLIFT SCENARIOS

The economic impact framework described above applies to both the Precinct's base case and uplift scenarios.

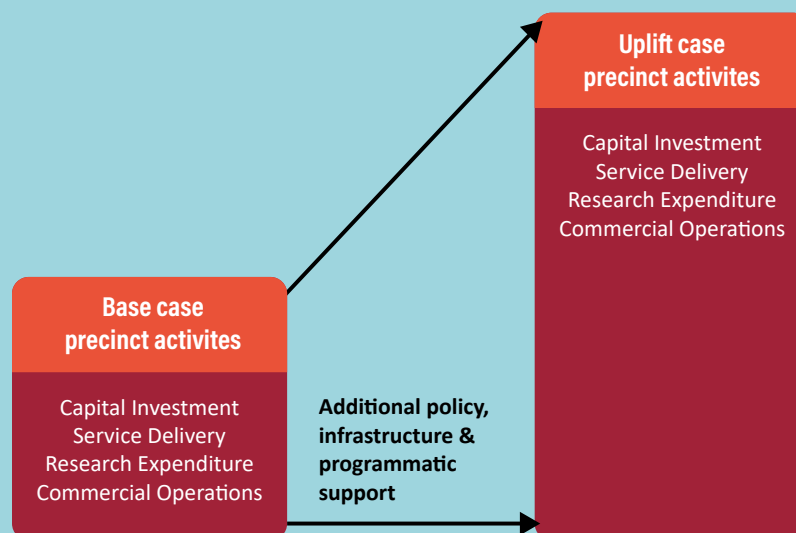
Essentially, the modelling logic is that additional policy, infrastructure and programmatic support for RHIP will enable it to increase and improve the activities accommodated within the precinct. That is, if additional support eventuates, then the Precinct will be able to accommodate more capital investment and workers, which in turn will enable more (and better) health and education services, research and commercial production activities to take place on site.

In the economic modelling, it has been assumed that the alternative (uplift) scenario enables more employment, service delivery (health and education), research and commercial tenant activities on site. This uplift commences in 2026 and gradually increases until the RHIP accommodates 20% more activity by 2040.

The industries¹⁷ that are assumed to benefit from the vast bulk of uplifted growth, include:

- Retail Trade
- Accommodation and Food Services
- Professional, Scientific and Technical Services
- Administrative and Support Services
- Education and Training, and
- Health Care and Social Assistance.

FIGURE 12: MOVING FROM 'BASE CASE' TO 'UPLIFT' SCENARIOS AT THE RHIP



Source: SGS, 2021

¹⁷ ABS standard industry classifications

5.3 ECONOMIC IMPACT RESULTS

BASE CASE RESULTS

TABLE 1: BASE CASE ECONOMIC IMPACT RESULTS (\$M, 2021)

	2021	2022	2023	2024	2025	2030	2040
DIRECT ECONOMIC IMPACTS							
Capital Investment		349.0	344.	469.5	469.5	56.3	56.3
Service delivery expenditure	2,111.3	2,147.1	2,183.8	2,221.3	2,273.3	2,474.7	2,938.2
Research expenditure	1,473.4	1,454.2	1,484.1	1,514.3	1,544.7	1,647.1	1,876.7
Commercial income	444.0	449.3	454.5	459.8	465.0	485.2	522.4
INDIRECT ECONOMIC IMPACTS							
Labour force skills	3,169.6	3,249.2	3,322.9	3,400.0	3,482.5	3,929.7	4,667.1
Labour force health	4,952.3	5,109.3	5,273.7	5,434.8	5,641.3	6,316.0	7,910.0
Research translation returns	3,449.9	3,490.1	3,561.9	3,634.3	3,707.4	3,953.1	4,504.1
International students	66.9	133.8	200.7	267.6	344.5	355.0	399.8
TOTAL ECONOMIC IMPACTS							
Gross Product (\$M)							
Greater Sydney (GRP)	4,650.2	4,794.2	4,854.1	5,011.0	5,158.1	5,822.9	7,717.1
New South Wales (GSP)	6,118.7	6,270.5	6,311.0	6,476.1	6,626.5	7,260.1	9,063.2
Australia (GDP)	9,050.6	8,686.7	8,397.9	8,333.9	8,351.4	9,143.0	11,610.7
Employment							
Greater Sydney	32.6	31.5	60.1	29.7	29.4	28.4	30.4
New South Wales	42.3	40.7	38.7	38.0	37.4	35.0	35.3
Australia	25.6	17.0	10.5	6.6	4.0	-0.2	-0.7

The Base Case modelling finds that:

- The RHIP generates very large contributions to Greater Sydney's Gross Regional Product (GRP¹⁸), estimated to rise from \$4.7B currently to \$7.7B p.a. in 2040, and with employment of approximately 30,000 Full time Equivalent (FTE¹⁹) jobs supported throughout this period
- Similar findings are modelled for NSW, with the precinct supporting \$6.1B in Gross State Product (GSP²⁰) currently, estimated to rise to \$9B by 2040, and supporting approximately 35,000 FTE jobs, and
- While there is a significant contribution to Australia's Gross Domestic Product (GDP²¹) of \$9B currently, rising to \$11.6B in 2040, employment levels at the national level are not materially impacted, as the modelling assumes there are national level labour market constraints. While Australia's employment does not grow, real wage levels by Australian workers do.



¹⁸ Gross Regional Product is the measure of size or net wealth generated by a local economy. It is the equivalent of Gross Domestic Product but for a smaller area (economy.id)

¹⁹ Full Time Equivalent is defined as a job where a person usually works 35 hours or more a week, and those who usually work less than 35 hours a week, work 35 hours or more in the reference week (ABS).

²⁰ Gross State Product is the measure of size or net wealth generated by a state economy

²¹ Gross Domestic Product is the measure of the nation's wealth which is generated by businesses, organisations and individuals working in an area (economy.id)

UPLIFT CASE RESULTS

TABLE 2: UPLIFT SCENARIO ECONOMIC IMPACT RESULTS (\$M, 2021)

	2021	2022	2023	2024	2025	2030	2040
DIRECT ECONOMIC IMPACTS							
Capital Investment		349.0	344.	469.5	469.5	101.4	101.4
Service delivery expenditure	2,111.3	2,147.1	2,183.8	2,221.3	2,273.3	2,629.8	3,525.9
Research expenditure	1,473.4	1,454.2	1,484.1	1,514.3	1,544.7	1,750.1	2,248.3
Commercial income	444.0	449.3	454.5	459.8	465.0	502.4	576.5
INDIRECT ECONOMIC IMPACTS							
Labour force skills	3,169.6	3,249.2	3,322.9	3,400.0	3,482.5	3,972.5	5,053.5
Labour force health	4,952.3	5,109.3	5,273.7	5,434.8	5,641.3	6,721.8	9,524.3
Research translation returns	3,449.9	3,490.1	3,561.9	3,634.3	3,707.4	4,200.2	5,395.9
International students	66.9	133.8	200.7	267.6	344.5	377.2	479.8
TOTAL ECONOMIC IMPACTS							
Gross Product (\$M)							
Greater Sydney (GRP)	4,650.2	4,794.2	4,854.1	5,011.0	5,158.1	6,115.3	8,837.7
New South Wales (GSP)	6,118.7	6,270.5	6,311.0	6,476.1	6,626.5	7,624.7	10,379.2
Australia (GDP)	9,050.6	8,686.7	8,397.9	8,333.9	8,351.4	9,458.4	12,563.4
Employment							
Greater Sydney	32.6	31.5	30.1	29.7	29.4	30.4	36.7
New South Wales	42.3	40.7	38.7	38.0	37.4	37.5	42.6
Australia	25.6	17.0	10.5	6.6	4.0	0.5	0.0

These Base Case results are largely echoed in the Uplift Case, with the estimates growing progressively from 2026 onwards. That is, under the Uplift Scenario, by 2040 the RHIP generates:

- Significant contributions to Greater Sydney's GRP (\$8.8B), NSW's GSP (\$10.4B) and Australia's GDP (\$12.6B), and
- Large numbers of FTE jobs for Greater Sydney at approximately 37,000, and for NSW 43,000 (includes the 37,000 Greater Sydney jobs), and real wage improvements at the national level²².

²² Employment across Australia is assumed to remain the same, as the size of the labour force is assumed to be a supply constraint in the economic modelling.

INCREMENTAL RESULTS

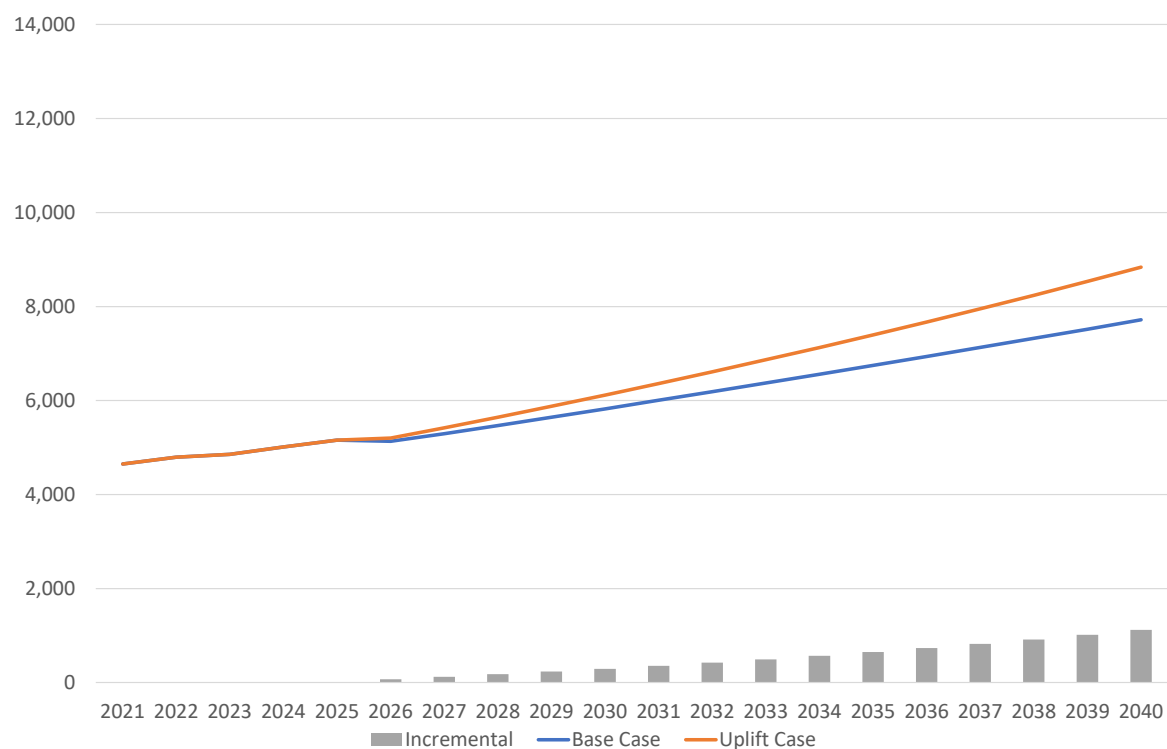
TABLE 3: INCREMENTAL ECONOMIC IMPACT RESULTS (\$M, 2021)

	2027	2028	2029	2030	2040
DIRECT ECONOMIC IMPACTS					
Capital Investment	45.1	45.1	45.1	45.1	45.1
Service delivery expenditure	57.9	88.8	121.2	155.1	587.6
Research expenditure	39.5	59.9	81.0	102.9	371.6
Commercial income	6.1	9.8	13.5	17.2	54.1
INDIRECT ECONOMIC IMPACTS					
Labour force skills	8.2	16.7	28.2	42.7	386.4
Labour force health	149.2	230.2	315.7	405.9	1,614.3
Research translation returns	94.9	143.7	194.4	247.0	891.8
International students	8.4	12.9	17.5	22.2	80.0
TOTAL ECONOMIC IMPACTS					
Gross Product (\$M)					
Greater Sydney (GRP)	123.4	176.8	233.0	292.4	1,120.5
New South Wales (GSP)	156.6	223.1	292.	364.6	1,316.0
Australia (GDP)	155.0	209.8	262.8	315.4	952.7
Employment					
Greater Sydney	0.9	1.3	1.6	2.0	6.2
New South Wales	1.2	1.6	2.0	2.5	7.3
Australia	0.6	0.6	0.7	0.7	0.6

If interventions can shift the trajectory of the Precinct from the Base Case to the Uplift Case, significant impacts will be generated in all three economies:

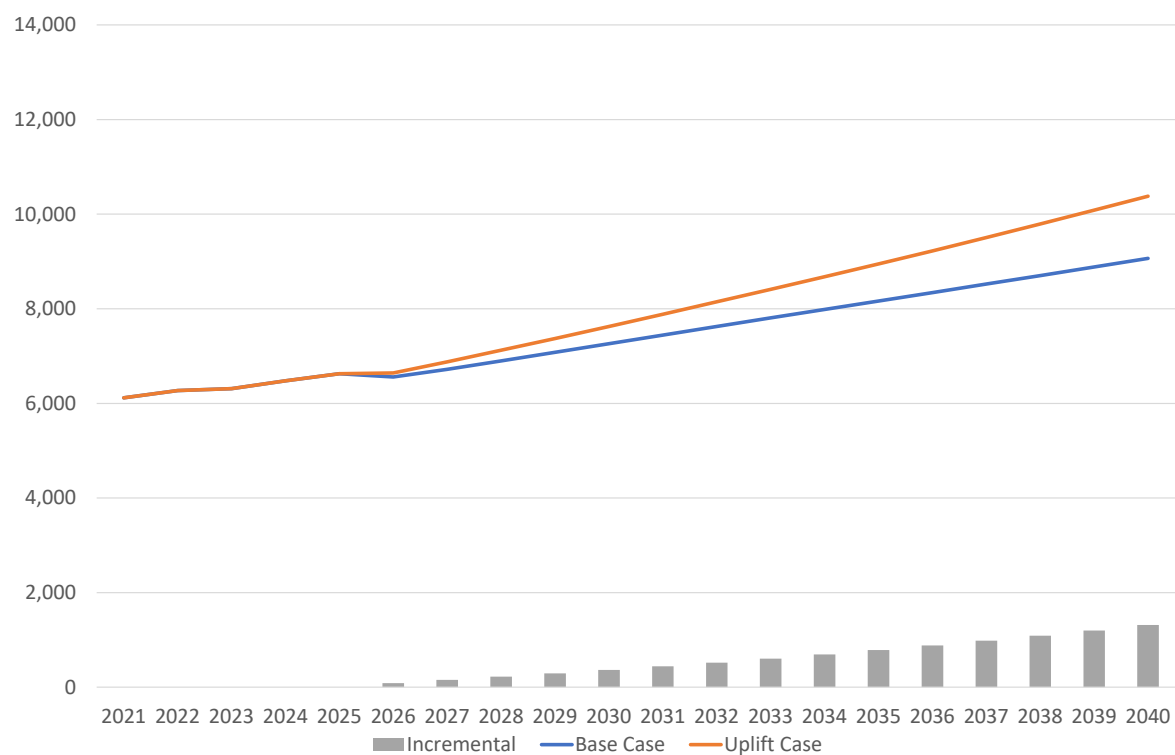
- Greater Sydney's annual GRP would be \$1.1B larger and more than 6,000 FTE additional jobs would exist by 2040
- NSW's annual GSP would be \$1.3B larger and more than 7,000 FTE jobs would exist by then, and
- Australia's annual GDP would be close to \$1B greater and real wages would be materially improved.

FIGURE 13: RHIP CONTRIBUTION TO GREATER SYDNEY'S GROSS REGIONAL PRODUCT (\$MILLION, 2021)



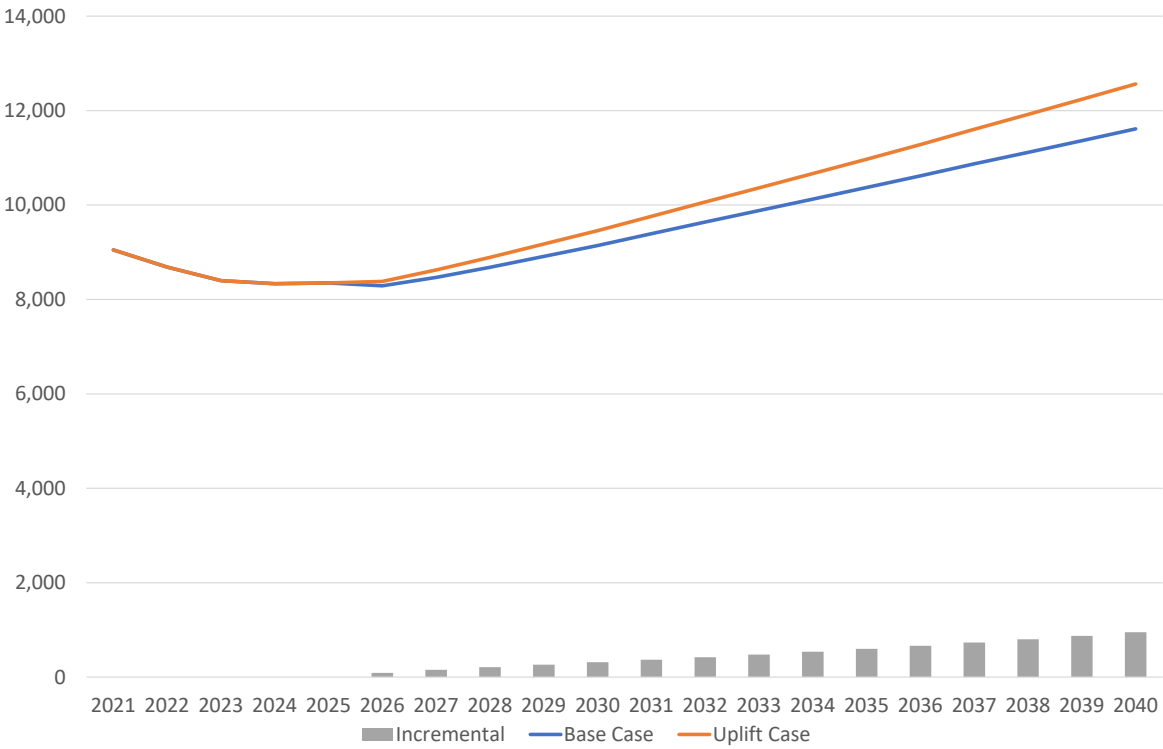
Source: SGS Economics & Planning & Centre of Policy Studies

FIGURE 14: RHIP CONTRIBUTION TO NSW' GROSS STATE PRODUCT (\$MILLION, 2021)



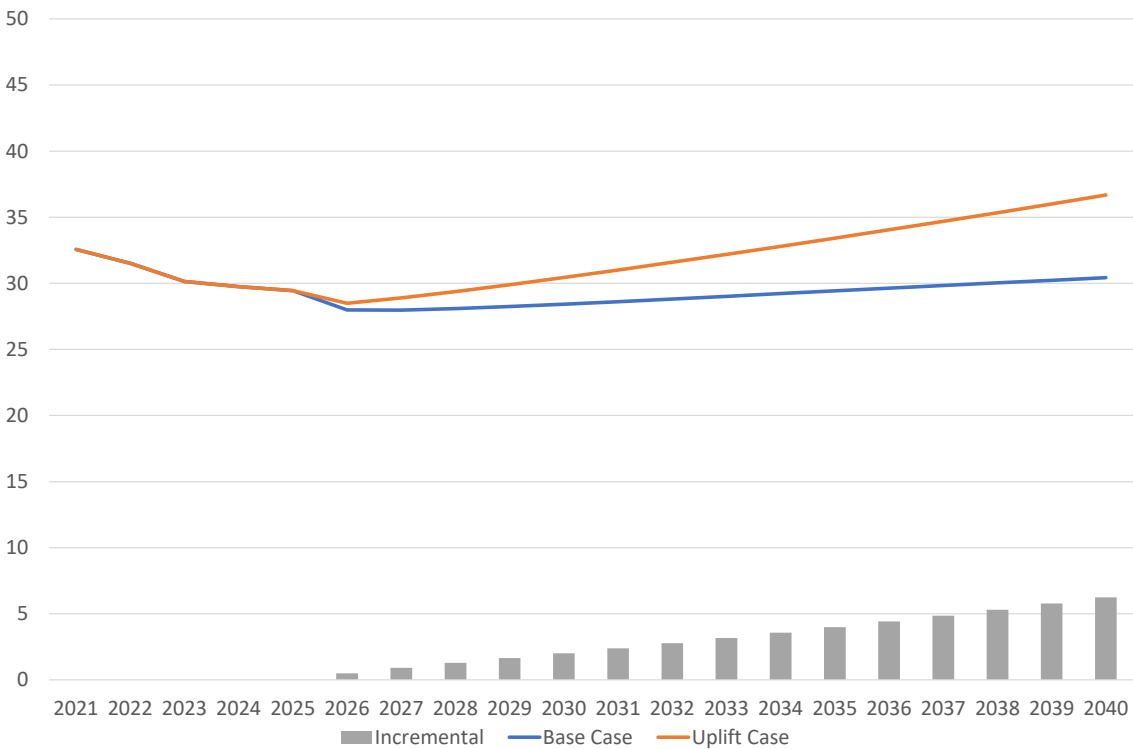
Source: SGS Economics & Planning & Centre of Policy Studies

FIGURE 15: RHIP CONTRIBUTION TO AUSTRALIA'S GROSS STATE PRODUCT (\$MILLION, 2021)



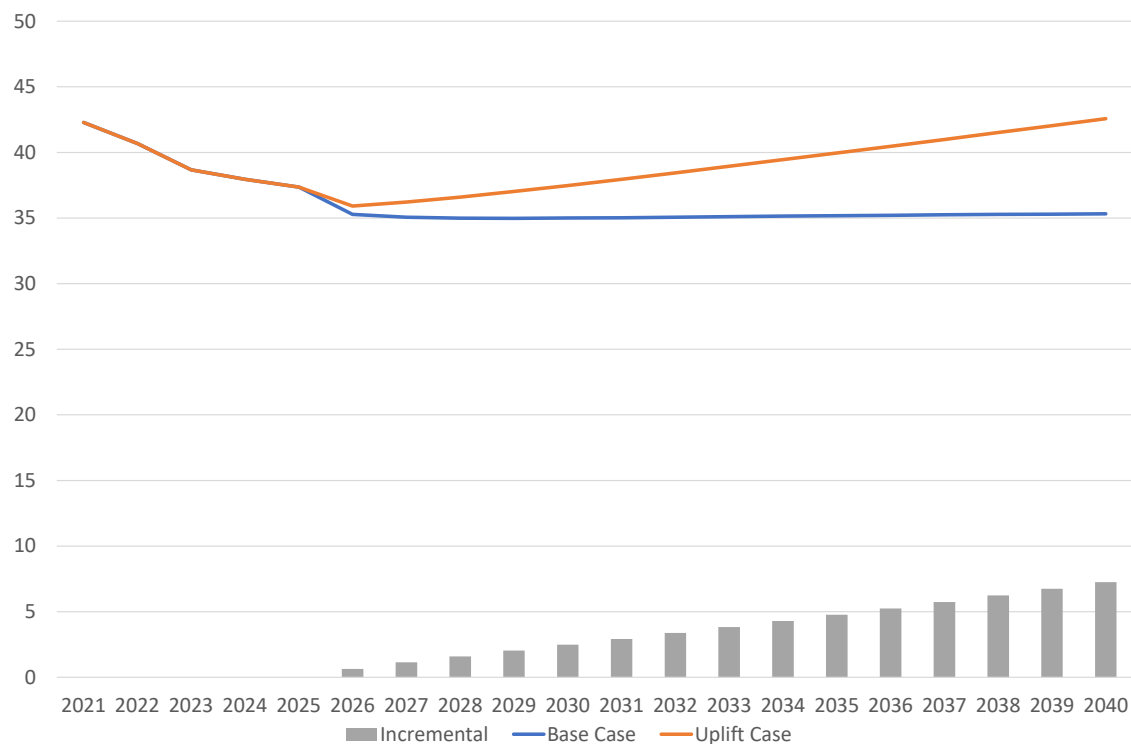
Source: SGS Economics & Planning & Centre of Policy Studies

FIGURE 16: RHIP CONTRIBUTION TO GREATER SYDNEY'S FTE EMPLOYMENT (THOUSANDS)



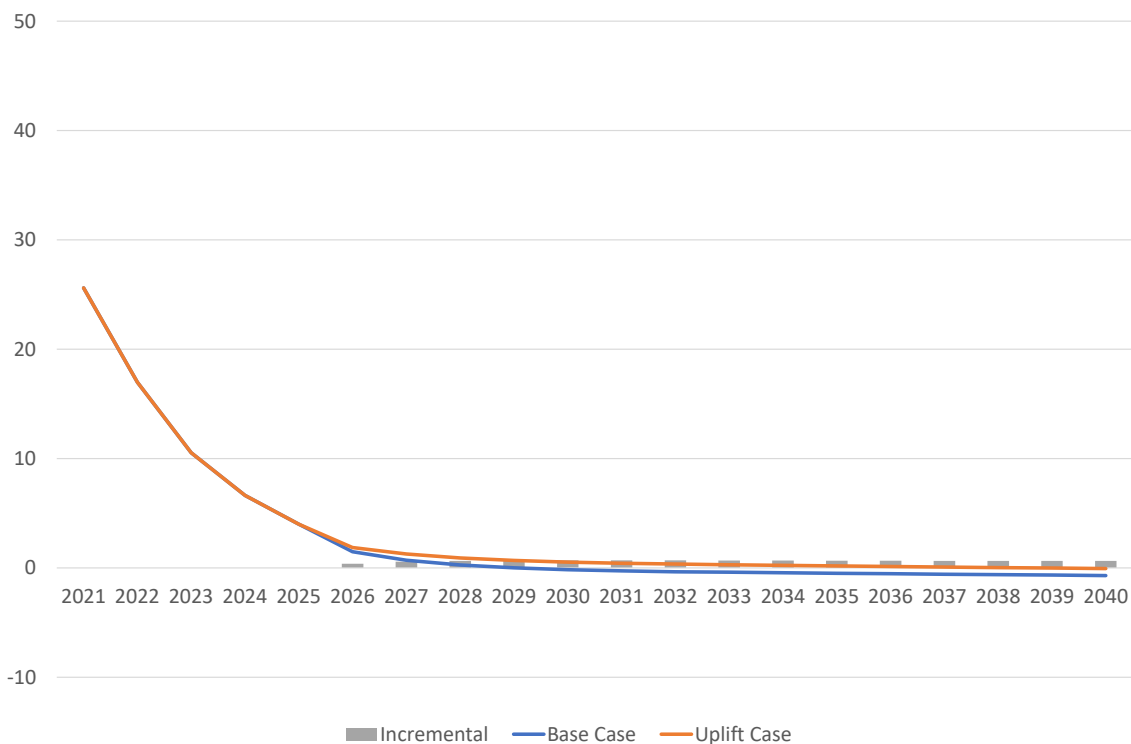
Source: SGS Economics & Planning & Centre of Policy Studies

FIGURE 17: RHIP CONTRIBUTION TO NSW' FTE EMPLOYMENT (THOUSANDS)



Source: SGS Economics & Planning & Centre of Policy Studies

FIGURE 18 : RHIP CONTRIBUTION TO AUSTRALIA'S FTE EMPLOYMENT (THOUSANDS)



Source: SGS Economics & Planning & Centre of Policy Studies

It is not possible to identify precisely what specific activities, research or products will come out of a successful RHIP and to then quantify the economic value of these. The economic impact analysis presented here cannot account for specific research or translation possibilities. Instead, it focuses on what the overall uplift in economic impact could be if the RHIP, as a whole, is better at collaboration, international student and researcher attraction, and improving health outcomes through treatment, research and trials. These would be more likely to be achieved, and therefore translated into higher economic impacts, if the RHIP developed in line with the innovation precinct success factors and opportunities identified in the preceding chapters.

As the stakeholder engagement identifies, the likely pillars of success for the RHIP lie in the increased potential for collaboration between a range of research, education and clinical trial activities. A precinct that supports deep collaboration across a diversity of activities and sectors is more likely to lead to innovative research or product outcomes that generate high levels of economic impact.

Chapter Four includes a number of examples that illustrate the degree of impact has been achieved by other health and innovation precincts and highlights the potential that could also be realised at the RHIP.



6. Conclusion

The RHIP has a significant number of existing strengths and assets upon which to build a globally recognised health and innovation precinct. Realising this ambition is likely to increase its economic impact above what it would otherwise achieve. To do so will require concerted and sustained investment in, and curation of the Precinct, over the long term to ensure that not only does it attract the private sector businesses, workers, students and other actors required to make it globally successful, but that it has the governance structures in place to ensure the benefits of co-location and knowledge sharing are maximised.

This report has identified:

- The existing assets of the Precinct
- The relative strengths and opportunities of the Precinct in the context of Greater Sydney
- Success factors in establishing a globally recognised innovation precinct
- Opportunities that the Precinct can achieve, as identified by stakeholders
- A potential 'uplift' economic impact scenario from a business-as-usual scenario.

The realisation of the increased economic impacts is contingent upon the RHIP establishing, capitalising, and nurturing the opportunities and success factors identified.

Appendix A: Case Studies

Below is a summary of various precinct performance against success factors. Precincts were assigned an amber rating by default, unless there were several positive features to note (change to green rating) or if there were fewer features to note compared to other precincts (change to red rating).

Success Factor	Parkville Melbourne	Gold Coast Health and Knowledge Precinct Queensland
<p>Quality of Place</p> <p>Does the precinct have a strong quality of place and offer quality experiences ('buzz') that accelerate outcomes and increase interactions?</p> 	<ul style="list-style-type: none"> • Located north of Melbourne CBD and close to amenity • Surrounded by highly liveable inner-city residential suburbs • Access to high quality open space and cultural facilities 	<ul style="list-style-type: none"> • Proximity to Southport Sharks entertainment precinct and accommodation • 7 ha of parkland, green space • Village heart, 2,500 residents • Lifestyle features of the Gold Coast (coastline, beaches, and rainforest)
<p>Diversity and Inclusion</p> <p>Is the precinct a diverse and inclusive place that provides broad opportunities?</p> 	<ul style="list-style-type: none"> • Supports a range of community services including youth justice, mental health, and aged care 	<ul style="list-style-type: none"> • Smith Collective- Australia's first Build to Rent community on the former site of 2018 Commonwealth Games
<p>Affordability</p> <p>Does the precinct provide a diversity of affordable premises for the business to locate in?</p> 	<ul style="list-style-type: none"> • Melbourne Biomedical Precinct (MBP) will include office space and labs to nurture a biomedical start-ups and small business presence • The MBP's strategic plan also identifies the role of precinct partners in offering innovation spaces 	<ul style="list-style-type: none"> • The Cohort Innovation Space offers over 2,500 sqm of co-working space, private offices boardrooms and event space • Lumina, the Queensland Government's 9.5 ha development-ready land is a commercial cluster offering offices, medical suites and labs with adaptable layouts and flexible cost structures

MaRS Innovation District Toronto, Canada

- Close to urban activity of Downtown Toronto
- Close to open space and recreation at Lake Ontario

- MaRS collaborated with #movethedial and PwC to produce the first national baseline report on gender diversity in Canadian technology
- MaRS' StandUp Ventures is a \$5-million fund requires successful ventures to have at least one female founder in a C-level role

- Diversity of premises includes: 1.5 million square feet of mixed tenant office space, labs, meeting and event space

Longwood Medical and Academic Area (LMA) Boston

- Inner urban area visited by 112,000 people each day
- Densely populated in the city during peak times
- Anecdotal evidence of few interactions between precinct workers and between offices and labs

- Features a mix of facilities and housing to support different age groups and lifestyles
- State-of-the-art hospital buildings, college facilities, apartment housing

- Longwood Medical and Academic Area offers 135 ha of total office and lab space packed densely onto 87 ha
- Rents are often higher than for comparable spaces due to its downtown location and proximity to healthcare institutions.

John Hopkins Medicine Maryland, Baltimore

- Access to high quality open space and community events
- Convenient access to a variety public transport

- John Hopkins is renewing its Roadmap to Diversity and Inclusion in 2020
- Creation of the Diverse Names and Narratives Project in 2021 to uplift the work of underrepresented individuals through renaming recommendations
- Student housing is available

- John Hopkins diversity of real estate options, including classroom and research space, office space, student/faculty housing and space equipped for the delivery of ambulatory health services

Success Factor	Parkville Melbourne	Gold Coast Health and Knowledge Precinct Queensland
Critical Mass <p>Does the area have a density of assets that collectively begin to attract and retaining people, stimulate a range of activities and increase financing?</p> 	<ul style="list-style-type: none"> • Employs over 49,000 people • Forecast to grow to almost 60,000 in knowledge jobs by 2030 • 55,000 students attend Melbourne University 	<ul style="list-style-type: none"> • 40,000 skilled workers • 1000 researchers and 700 research students • Gold Coast University Hospital employs 9,522 staff. • 29,000 students
Infrastructure <p>Does the precinct have the necessary utilities, IT and infrastructure and building stock to accommodate critical mass and support connectivity, collaborating and innovation?</p> 	<ul style="list-style-type: none"> • Three leading universities and the University High School • 3 major hospitals • Bio21 Institute- \$140 million core research and development facility and multidisciplinary research centre. Includes CSL Limited, global hub for Early Research and Translational Medicine 	<ul style="list-style-type: none"> • \$5 billion investment for a range of critical infrastructure including the Gold Coast university hospital and Gold Coast Light Rail • Bus services connecting to the Southport CBD and Surfers Paradise as well as heavy rail to Brisbane and M1 access
Accessibility <p>Does the precinct have access to deep pools of labour and other firms through broad transport networks and local streets and footpaths?</p> 	<ul style="list-style-type: none"> • Located near a critical mass of knowledge workers in Melbourne CBD • Highly accessible location on the border of the CBD with tram routes via Swanston and Elizabeth streets • Metro Tunnel station opening in 2025 to enhance CBD connection. 	<ul style="list-style-type: none"> • Located near universities and education providers, including Gold Coast University Hospital, TAFE Gold Coast • Research centres and institutes include the Institute for Glycomics, Menzies Health Institute Queensland and the Cities Research Institute • BJP Laboratories.

MaRS Innovation District Toronto, Canada	Longwood Medical and Academic Area (LMA) Boston	John Hopkins Medicine Maryland, Baltimore
<ul style="list-style-type: none"> • Home to 150 organisations and 6,000 jobs, supporting over 1,400 Canadian science and technology companies • 17,200 employed by MaRS-supported companies in 2018 • The University of Toronto St George Campus is home to 62,864 students • \$500m revenue pa 	<ul style="list-style-type: none"> • Employment reached nearly 68,000 jobs (2021) • Longwood’s 68,000 jobs have generated an additional 87,000 outside of the area • In 2021, Harvard’s Faculty of Medicine employs over 11,000 individuals, including nearly 200 tenured and tenure-track faculty members and educates 27,000 students 	<ul style="list-style-type: none"> • Johns Hopkins Medicine employs more than 40,000 full-time faculty and staff members, teaches 480 students and offers 902 research labs • An \$8.9 billion integrated global health enterprise, it is the leading U.S. academic institution in total research and development spending
<ul style="list-style-type: none"> • 1.5 million sq ft. of corporate offices, research facilities, startup spaces, and science labs • MaRS’ four buildings connect directly to the subway and Toronto General Hospital • Transport connectivity via subway, bus, train and streetcar 	<ul style="list-style-type: none"> • MASCO offers planning, transportation, and coordination support to Boston’s many institutions • Recent upgrades to roads and footpath infrastructure to increase walkability and safety in the LMA • Highly accessible by several public transport options 	<ul style="list-style-type: none"> • Highly accessible location by bus, metro, light rail and MARC train
<ul style="list-style-type: none"> • Located near universities, research institutes, high growth companies and global tech leaders, including University of Toronto, Princess Margaret Cancer Centre, Ontario Institute for Cancer Research and Facebook 	<ul style="list-style-type: none"> • Located near universities including Harvard University, MIT and medical and research institutions in Longwood Medical Area 	<ul style="list-style-type: none"> • Located near the Johns Hopkins Hospital, the Johns Hopkins Bayview medical centre and Johns Hopkins community physicians

Success Factor	Parkville Melbourne	Gold Coast Health and Knowledge Precinct Queensland
<p>Anchor Institutions</p> <p>Does the precinct have anchor institutions, such as research organisations or large corporates, that are present, relevant and engaged with industry?</p> 	<ul style="list-style-type: none"> Universities, hospitals and medical research institutes, including Go8 University of Melbourne, the Royal Melbourne Hospital and the Walter and Eliza Hall Institute 	<ul style="list-style-type: none"> Griffith University Gold Coast Private Hospital Gold Coast University Hospital
<p>Competitive Advantage</p> <p>Is the precinct leveraging and aligning its distinctive assets, including historical strengths, to grow firms and jobs in the district, city and region?</p> 	<ul style="list-style-type: none"> Five clinical research strengths which will generate the strongest health and economic impact over the next 10 years Australia's highest-ranking University, University of Melbourne and over 30 world class hospitals Home to Australia's largest pharmaceutical company CSL 	<ul style="list-style-type: none"> Clinical trials are catered for in both hospital and university facilities and are approximately 60% cheaper in Australia for early-phase clinical trials than in the US, after tax incentives
<p>Collaboration</p> <p>Is the precinct connecting the dots between people, institutions, economic clusters, and place, creating synergies across multiple scales and platforms?</p> 	<ul style="list-style-type: none"> The precinct has over 34 partners including industry and peak bodies Collaboration with research organisations throughout Australia and the world Adopts a network approach to working with other National Employment and Innovation Clusters (Monash, Deakin, La Trobe) Joint ventures between universities such as BioCurate 	<ul style="list-style-type: none"> The precinct has a range of programs to support entrepreneurs and innovators in place which are delivered by COHORT and the Griffith Innovation Centre Support and programs include mentoring, business health checks, 3-day start up, experts program and young women in AI

MaRS Innovation District Toronto, Canada

- 120 curated tenancies
- Colocation of University, Hospitals and MRIs and critical mass of industry/start-ups

- Brokerage role between government, regulators, colleges, healthcare providers and other key stakeholders
- Toronto has one of the highest concentrations of AI experts in the world and the strongest patenting and VC investment in Canada

- MaRS Venture Services: Accelerates the growth of more than 1,000 young companies with technology solutions to improve lives
- MaRS has partnered with a range of stakeholders to help innovative companies grow globally, to launch Canada's first social impact bond, and to assist health innovators to navigate regulatory processes to expedite products to market

Longwood Medical and Academic Area (LMA) Boston

- Boston attracts young biotech firms due to range of financing opportunities from venture capitalists and life sciences investment funds

- MASCO has promoted a greater sense of community among member organisations in the LMA
- Offers programs and services to support inter-organisational collaboration

- MA hospitals and outpatient clinics build, support and staff mission-related community health programs to cure and prevent disease in Boston and its surrounding neighbourhoods
- LMA institutions invest \$2.9 million annually in school-based workforce, career and mentoring programs to support students interested in medical research

John Hopkins Medicine Maryland, Baltimore

- The Johns Hopkins University School of Medicine, which consistently ranks among the nation's very best in education

- John Hopkins is nationally ranked in 15 adult and 10 paediatric specialties
- Wide research focus: cancer research, genetics research and genome biology

- Range of global collaborations, including with Brazil, China and joint research and nursing efforts in Colombia
- Technology Innovation Centre collaborates with researchers and healthcare providers to create digital healthcare solutions across Johns Hopkins
- Office of Technology Ventures supports Hopkins faculty and students transform their discoveries and inventions into enterprises

	Parkville Melbourne	Gold Coast Health and Knowledge Precinct Queensland
Precinct	<ul style="list-style-type: none"> 600 hectares 	<ul style="list-style-type: none"> 200 hectares Proximity to Southport Sharks entertainment precinct and accommodation Extensive parkland and green spaces (7 ha) 2,500 residents Village heart Lumina is the precinct's 9.5-hectare commercial cluster COHORT co-working desks, offices and labs and events and programs operates across 3 buildings with over 2,500sqm of internal space including 46 coworking desks, 3 PC1 and PC2 research labs, 930 sqm for private tenancies, 3 meeting rooms, 2 boardrooms, 120-person event space, podcast studio, outdoor gym space and end of trip facilities.
Floorspace	<ul style="list-style-type: none"> Bio21: 70 000 square metres of floor area CSL: 35 000 square metre site 	<ul style="list-style-type: none"> 2,500 sqm internal space for coworking/research labs, 930sqm for private tenancies

**MaRS Innovation District
Toronto, Canada**

- 14 hectares
- Close to amenity and urban activity of Downtown Toronto and open space and recreation with Lake Ontario
- MaRS is comprised of 14 hectares or 1.5 million square feet, 120 tenants including research labs and global tech companies.

- Research labs
- West Tower commercial floorspace: 72,464 sqm
- A hub at Toronto's Waterfront Innovation Centre is underway. When opened in 2021 will create approximately 37,000 sqm of commercial space

**Longwood Medical and
Academic Area (LMA)
Boston**

- 86 hectares (LMA only)
- Harvard campus 2,054 hectares
- The Longwood Medical and Academic Area is a dense inner urban area
- World-class medical and academic centre
- Each day 112,000 people visit the LMA, making this one of the most densely populated areas in the city during peak times

**John Hopkins Medicine
Maryland, Baltimore**

- 12 – 13 hectares
- Access to high quality open space and community events
- Critical mass of medical and health facilities
- Convenient access to a variety public transport

- 3ha Johns Hopkins Hospital

	Parkville Melbourne	Gold Coast Health and Knowledge Precinct Queensland
Number of Students	<ul style="list-style-type: none"> 55,000 students 	<ul style="list-style-type: none"> 29,000 students
Number of Jobs	<ul style="list-style-type: none"> Employs over 49,000 people 	<ul style="list-style-type: none"> 40,000 skilled workers Gold Coast University Hospital employs 9,522 staff

Source: SGS, 2021

**MaRS Innovation District
Toronto, Canada**

- 62,864 students (43,790 undergraduates)

- 150 organisations and 6,000 jobs. Support over 1,400 Canadian science and tech companies. 17,200 people
- The Waterfront Centre to accommodate 3,000 workers
- Employed by MaRS supported companies in 2018

**Longwood Medical and
Academic Area (LMA)
Boston**

- Harvard's Faculty of Medicine includes over 11,000 individuals working across labs, classrooms and clinics, the school's main quadrangle houses nearly 200 tenured and tenure-track faculty members in basic and social science departments and classrooms
- Longwood educates 27,000 students (2021)

- Employment in Longwood reached nearly 68,000 jobs (2021). The small, dense area creates jobs and economic activity in every community of the state, with Longwood's 68,000 jobs producing an additional 87,000 outside of the area

**John Hopkins Medicine
Maryland, Baltimore**

- 480 students at Johns Hopkins Medical School

- Employs more than 40,000 full-time faculty and staff members

CASE STUDIES: LESSONS LEARNT

A number of insights can be drawn from the case studies that illustrate what successful precincts look like and what RHIP can do to advance its already strong foundations. What is clear from this evaluation of other successful precincts is the emphasis on the quality of place, the critical mass of activities and the importance of anchor institutions in defining the precinct's identity.

The evaluated precincts also placed a high emphasis on ensuring superior transport access to precinct was available to help to achieve their long term goals.

Successful precincts also had the following key attributes:

- A clear vision and mission pursued assiduously
- A distinctive brand based on unique features or areas of competitive advantage with global resonance
- Strong governance arrangements with representation from MRIs and industry (in some cases biomedical institutions)
- Close ties and collaboration between the hospital(s) and universities and support for student population including through mentoring and placements

Larger more established precincts also demonstrated:

- A networked approach to growing the precinct which is mindful of and collaborates with other state significant health and education precincts and or clusters (for example, Melbourne's Biomedical Precinct)
- A community/population health focus targeting preventative health and tackling the burden of disease for local populations. This included the presence of community health organisations in and around the precinct
- Complementary activity including research lab space/start-ups occurring outside of the precinct boundaries, including at nearby university campuses or within the CBD
- A holistic understanding that innovators require not only lab and office space but a platform to meet, interact and create
- Targeted programming and incentives for start-ups and scale-ups.

KEY DRIVERS OF ECONOMIC IMPACT

The following were recognisable drivers of economic impact within the precincts examined:

- A commitment to research translation and the development of health solutions by the governance/ leadership group
- Research and lab space and platform technologies (advanced microscopy, cultural informatics, metabolomics, and health economics) for start-ups for example MaRS and Bio21 (provided by Melbourne University)
- Business incubation and entrepreneurship skills development, such as that offered onsite by MaRS and Bio21. Bio21 also shares a commitment to intellectual property protection and technology transfer
- Data analytics and data access and collection innovation a focus for MaRS and John Hopkins Solutions
- Access to deep pools of philanthropy, venture capital and life sciences funds
- Brokerage role to connect ventures with capital, talent and assistance navigating the regulatory environment.

The approach taken by MaRS confirms the findings from previous work by SGS which suggests the following precinct attributes are important to start-ups/innovators:

- Funding that is sufficient for the start-up phase and creates revenue streams to achieve operational sustainability as soon as practicable
- Financing for new ventures that is accessible, informed, and embedded
- Marketing and investment attraction
- Tenant curation/selection (corporates, start-ups and scaleups)
- Collaboration brokerage (investors/financiers).

This inter-related suite of success factors and insights from case studies articulate what RHIP needs to do from a physical, functional, cultural and governance perspective to have the best chance of succeeding. However, it must also ensure it builds upon the existing strengths and prioritise the opportunities for future development that have been articulated through Chapters 2, 3 and 4.

Appendix B: Comparison of lighthouse precincts

To understand what role the RHIP plays in the metropolitan-wide health and innovation ecosystem, it is instructive to understand what its relative strengths and weaknesses are compared with other precincts. The following illustration compares the RHIP against the three Lighthouse Precincts from a perspective of their over-arching vision, scale and complexity of functions, expected levels of growth, areas of research focus and recognised excellence.

	WESTMEAD	TECH CENTRAL/ CAMPERDOWN H&E PRECINCT	WESTERN SYDNEY AEROTROPOLIS	RANDWICK HEALTH & INNOVATION PRECINCT
Vision	Australia's premier health and innovation district and an ecosystem for new discoveries, economic growth and global recognition	A major biotechnology research hub that leverages its proximity to deep medical research and education links throughout the RPA & USYD campuses	A major centre for Western Sydney as part of the vision for Greater Sydney as a metropolis of three cities	A transformative and collaborative place of excellence solving global challenges to enhance and nurture lifelong health
Critical Mass	Four major hospitals Four world leading MRI facilities University of Sydney Western Sydney University Largest research-intensive pathology service in NSW	Royal Prince Alfred Hospital TAFE NSW University of Notre Dame University of Sydney University of Technology Sydney	N/A	Four hospitals (Prince of Wales, Sydney Children's Hospital, Royal Hospital for Women & Prince of Wales Private Hospital) Nine Medical Research Institutes *
Floorspace	75 Hectares 400,000 sqm of high-end health related developments	72 Hectares (USYD Campus) 50,000 sqm floorspace for start-ups proposed at Central Station Camperdown Biotech Hub proposed	N/A	60 Hectares Masterplan process underway in 2021
Economic Impact	<ul style="list-style-type: none"> • 18,000 specialised/high value jobs • 11,096 hospital staff • 2,000 USYD medical students • 2.9 million non-admitted patient services; 58,983 ambulance presentation • \$3 billion committed by Government, University & private sector 	<ul style="list-style-type: none"> • 12,000 across SLHD Hospitals • Approx. 39,000 students (25,000 international) at USYD • \$48.2 million to kick start the development of Tech Central and the backing of Atlassian • \$750m redevelopment 	N/A	<ul style="list-style-type: none"> • 22,000 workforce • 58,000 students • 1.8 million patient interactions • \$1 billion infrastructure investment by UNSW, NSW Government and Commonwealth **
Forecast Growth	30,000 workers and over 10,000 students by 2036	25,000 additional innovation jobs 150,000 sqm of net lettable floorspace for technology companies 100 new scale up companies & 25,000 life science based students	200,000 jobs in the Western Parkland City across aerospace and defense, manufacturing, healthcare, freight and logistics, agribusiness, education and research industries	Under and 'Uplift' scenario, the RHIP is estimated to contribute 37,000 FTE to Greater Sydney's economy, 43,000 to NSW's economy and real wage improvements at a national level by 2040
Research Focus	<p>Organised into 5 dimensions:</p> <ul style="list-style-type: none"> • Liver and metabolic • Cancer • Neuroscience and vision • Infection and immunity • Cardio- respiratory <p>The Westmead Institute for Medical Research (WIMR) multi-disciplinary and translational approach to medical research. Established in 2000 with an \$11 million building. Offers core technologies: cell imaging, flow cytometry, genomics and biobank</p>	<p>RPA's research strengths include its premier research groups of:</p> <ul style="list-style-type: none"> • Biomedical Research • Clinical Research • Public and population health research • Health Services research <p>University has 8 multidisciplinary centres and initiatives:</p> <ul style="list-style-type: none"> • Brain and mind centre • Cancer research network • Charles Perkins Centre (lifestyle diseases) • Sydney Nanoscience • Marie Bashir Institute (biosecurity) 	<ul style="list-style-type: none"> • Aerospace and defense • Manufacturing • Healthcare • Freight and logistics • Agribusiness • Education • Research industries <p>Attraction of major research partners- CSIRO, Multiversity Campus, Advanced Manufacturing Research Facility (AMRF), TAFE</p>	<p>Organised into four dimensions:</p> <ul style="list-style-type: none"> • Children's cancer • Neuroscience, mental health, drug and addiction • Virtual Health • Personalised Medicine (Genomics and Genetics)
University ERA Scores	USYD above world standard across many categories including clinical services, medical and health sciences. Higher score than UNSW in Public Health and Health Services	USYD above world standard across many categories including health services, medical and health sciences. Higher score than UNSW in Public Health & Health Services	N/A	USYD above world standard across many categories. Outperforms USYD in Immunology and Neurosciences

Source: Various, 2021

* Nine Medical Research Institutes researching in cancer, neuroscience, mental health, biomedical sciences & robotics

** Under and 'Uplift' scenario, the RHIP is estimated to contribute \$8.8B to Greater Sydney's GRP, \$10.4B to NSW's GSP and \$12.6B to Australia's GDP by 2040.

Appendix C: Estimation methods and data sources

ESTIMATION METHODS & DATA SOURCES

EMPLOYMENT PROJECTIONS

SGS produces long term employment projections at the small area (travel zone) level for NSW infrastructure planning agencies. The Base Case projections relevant to the RHIP's geographic boundaries have been adopted for the RHIP Base Case scenario over the coming decades.

TABLE 4: BASE CASE EMPLOYMENT PROJECTIONS (2021-2030)

	2021	2022	2023	2024	2025	2030
Health Jobs	6,160	6,300	6,441	6,581	6,722	7,574
Education jobs	8,052	8,100	8,148	8,196	8,244	8,738
Other jobs	2,915	2,948	2,980	3,012	3,044	3,174
Total jobs	17,127	17,348	17,569	17,790	18,010	19,486

CAPITAL INVESTMENT

Committed capital investment of \$1,636 million is anticipated from project stakeholders over the coming five years. We have assumed this investment is spread equally across 2022 to 2025 inclusive.

Capital investment beyond 2025 has been linked to the employment growth in the precinct's Base Case and Uplift scenarios, using:

- Jobs to floorspace ratios, and
- Floorspace construction cost estimates per square metre.

TABLE 5: BASE CASE CAPITAL INVESTMENT PROJECTIONS (2021 - 2030)

	2021	2022	2023	2024	2025	2030
Capital investment (\$m)	-	\$349.0	\$344.5	\$469.5	\$469.5	\$56.2

SERVICE DELIVERY

Historic health and education service delivery (staff and other operating) costs within the Precinct have been sourced from Precinct stakeholders and, where available, their published annual reports.

Future service delivery (staff and other operating costs) costs have been linked to the number of health and education staff in the Precinct's Base Case and Uplift scenarios.

TABLE 6: BASE CASE SERVICE DELIVERY EXPENDITURES (2021 - 2030)

	2021	2022	2023	2024	2025	2030
Health (\$m)	\$1,092.0	\$1,105.0	\$1,118.2	\$1,131.6	\$1,145.1	\$1,215.3
Education (\$m)	\$1,019.3	\$1,042.0	\$1,065.6	\$1,089.7	\$1,128.2	\$1,096.9
Total (\$m)	\$2,111.3	\$2,147.1	\$2,183.8	\$2,221.3	\$2,273.3	\$2,312.1

RESEARCH EXPENDITURE

Historic research staff and expenditures within the Precinct have been sourced from Precinct stakeholders where possible. For UNSW we have extracted timeseries data from the ABS' latest Higher Education Research & Experimental Development, Higher Education Organisations publication.

Future research staff and expenditures have been linked to the employment numbers in the Precinct's Base Case and Uplift scenario.

TABLE 7: BASE CASE RESEARCH EXPENDITURES (2021 - 2030)

	2021	2022	2023	2024	2025	2030
Research (\$m)	\$1,437.4	\$1,454.2	\$1,484.1	\$1,514.3	\$1,544.7	\$1,647.1

COMMERCIAL INCOME GENERATION

Commercial incomes generated within the Precinct have been linked with commercial employment, covering the forecast period.

These inputs have been transformed to commercial incomes using industry income generation to job ratios derived from the ABS dataset 81550DO001_201920 Australian Industry, 2019-20.

To avoid double counting with service delivery expenditures, we have removed 30% of the commercial incomes generated by commercial tenants within the Precinct. That is, the proportion of commercial incomes that are directly funded by service delivery expenditures have been removed.

TABLE 8: BASE CASE COMMERCIAL INCOME GENERATION (2021 TO 2030)

ANZISC Category	2021	2022	2023	2024	2025	2030
Manufacturing (\$m)	\$2.9	\$2.9	\$2.9	\$2.9	\$2.9	\$3.0
Construction (\$m)	\$117.9	\$119.1	\$120.3	\$121.5	\$122.7	\$129.0
Wholesale Trade (\$m)	\$27.3	\$27.6	\$27.9	\$28.1	\$28.4	\$29.4
Retail Trade (\$m)	\$31.3	\$31.8	\$32.4	\$32.9	\$33.4	\$35.7
Accommodation and Food Services (\$m)	\$52.6	\$53.0	\$53.5	\$53.9	\$54.4	\$57.2
Transport, Postal and Warehousing (\$m)	\$1.2	\$1.2	\$1.2	\$1.2	\$1.2	\$1.2
Information Media & Telecomm (\$m)	\$4.7	\$4.7	\$4.7	\$4.8	\$4.8	\$4.9
Financial and Insurance Services (\$m)	\$3.5	\$3.5	\$3.5	\$3.5	\$3.5	\$3.6
Rental, Hiring and Real Estate Services (\$m)	\$6.7	\$6.8	\$6.9	\$7.0	\$7.2	\$7.5
Prof., Scientific & Tech Services (\$m)	\$127.9	\$130.1	\$132.2	\$134.4	\$136.6	\$143.2
Administrative and Support Services (\$m)	\$15.5	\$15.5	\$15.5	\$15.5	\$15.6	\$15.9
Public Administration and Safety (\$m)	\$14.7	\$14.8	\$15.0	\$15.1	\$15.2	\$15.9
Arts and Recreation Services (\$m)	\$26.2	\$26.4	\$26.6	\$26.8	\$26.9	\$28.5
Other Services (\$m)	\$11.6	\$11.8	\$11.9	\$12.1	\$12.2	\$12.9
Total (\$m)	\$444.0	\$449.3	\$454.5	\$459.8	\$465.0	\$487.9

LABOUR FORCE SKILLS DEVELOPMENT

The number and composition (by qualification level) of students graduating from the Precinct have been sourced from Precinct stakeholders.

Medium to long term estimates of students have been linked with the number of education staff accommodated within the Precinct under the Precinct's Base Case and Uplift scenario.

TABLE 9: BEST CASE STUDENT GRADUATION RATES (2021 - 2030)

	2021	2022	2023	2024	2025	2030
Undergraduate students	5,873	6,041	6,214	6,392	6,575	6,978
Postgraduate students	3,261	3,299	3,338	3,377	3,417	3,627

The value of labour force skills development reflects the annual income earning differences between graduating students and non-tertiary qualified labour force members in Sydney, as estimated using published ABS Census statistics.

TABLE 10: BEST CASE LABOUR FORCE SKILLS DEVELOPMENT (2021 - 2030)

	2021	2022	2023	2024	2025	2030
Undergraduate income gains (\$m)	\$2,547.9	\$2,622.7	\$2,694.3	\$2,767.3	\$2,845.1	\$3,267.2
Postgraduate income-gains (\$m)	\$621.7	\$626.6	\$628.5	\$632.7	\$637.4	\$662.5

LABOUR FORCE HEALTH IMPROVEMENTS

The number and composition (by AIHW Disease Group) of patient separations (treatments) within the Precinct have been sourced from Precinct stakeholders.

Medium to long term estimates of patient separations (by type) have been linked with the number of health staff accommodated within the precinct under the Precinct's Base Case and Uplift scenarios.

TABLE 11: BASE CASE LABOUR FORCE HEALTH IMPROVEMENTS (2021 TO 2030)

	2021	2022	2023	2024	2025	2030
Black Dog Institute	31,295	39,436	47,577	55,718	63,859	701,111
Prince of Wales Hospital	522,359	532,684	543,009	553,335	563,660	630,023
Royal Women's Hospital	134,880	137,336	139,791	142,247	144,702	161,838
Eastern Sydney Mental Health Services	64,598	66,577	68,557	70,536	72,516	80,723
Prince of Wales Hospital Private	34,277	34,270	35,234	35,768	42,273	50,531
Total	787,409	810,303	834,169	857,604	887,011	993,226

RESEARCH TRANSLATION

The number of research staff and value of research expenditures within the Precinct have been sourced from Precinct stakeholders and ABS datasets as discussed earlier.

Medium to long term estimates of research expenditures have been linked with the assumed number of research staff accommodated within the Precinct under the Precinct's Base Case and Uplift scenarios.

The value of research translation has been estimated using the results of a global literature review of the return on investment generated by research expenditures, which found that the return on investment generated generally ranged between \$5 and \$10 per dollar invested, over the course of three decades. We have adopted the midpoint estimate of \$7.50 return per dollar invested²³.

It is noted that some research and development expenditures generate returns far more than this. For example, the returns that the Astra Zeneca vaccine have already generated must be enormous, after considering the global health and economic costs avoided through effective vaccination. Of course, Astra Zeneca hails from the Oxford precinct in England.

Nonetheless, it is very difficult to include such large returns in the economic modelling due to their inherent unpredictability. Having said this, similar research breakthroughs are naturally the target for researchers accommodated within the RHIP, along with their global research partners.

INTERNATIONAL STUDENT EXPORTS

The number of international students within the Precinct has been estimated based on historical enrolments. SGS has assumed that international student numbers in 2021 are only 20% of 2019 levels, with numbers fully recovering to 2019 levels by 2025.

Longer term estimates of student expenditures have been linked with the assumed number of education and research staff accommodated within the Precinct under the Precinct's Base Case and Uplift scenario.

TABLE 12: BASE CASE INTERNATIONAL STUDENT NUMBERS (2021 TO 2030)

	2021	2022	2023	2024	2025	2030
International students	4,968	9,935	14,903	19,870	24,838	26,359

The value of international students to the economy reflects their annual consumption expenditures while studying and living in Sydney, NSW which equates to approximately \$20,000 per annum.

We have assumed that 90% of international students live and study in Sydney, i.e. 10% study remotely from their home country. Moreover, to avoid any double counting, we have assumed that 30% of international student expenditures are made within the Precinct, and therefore are already included in the 'service delivery' and/or 'commercial income' impacts previously described.

TABLE 13: BASE CASE INTERNATIONAL STUDENT EXPENDITURES (2021 TO 2030)

	2021	2022	2023	2024	2025	2030
International student expenditures (\$m)	\$66.9	\$133.8	\$200.7	\$267.6	\$334.5	\$355.0

VALUE CHAIN LINKAGES

SGS has modelled the value of value chain linkages using the Computable General Equilibrium model developed and maintained by the Centre of Policy Studies (COPS) at Victoria University.

This modelling was undertaken for the Greater Metropolitan Area of Sydney, New South Wales and Rest of Australia economies. Additional detail on COPS' CGE model is available at www.vu.edu.au/centre-of-policy-studies-cops.

²³ We have ensured that these returns are not double counted in the Computable General Equilibrium modelling

MELBOURNE

Level 14, 222 Exhibition Street
Melbourne VIC 3000
+61 3 8616 0331
sgsvic@sgsep.com.au

CANBERRA

Level 2, 28-36 Ainslie Avenue
Canberra ACT 2601
+61 2 6257 4525
sgsact@sgsep.com.au

HOBART

PO Box 123
Franklin TAS 7113
+61 421 372 940
sgstas@sgsep.com.au

SYDNEY

209/50 Holt Street
Surry Hills NSW 2010
+61 2 8307 0121
sgsnsw@sgsep.com.au



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