



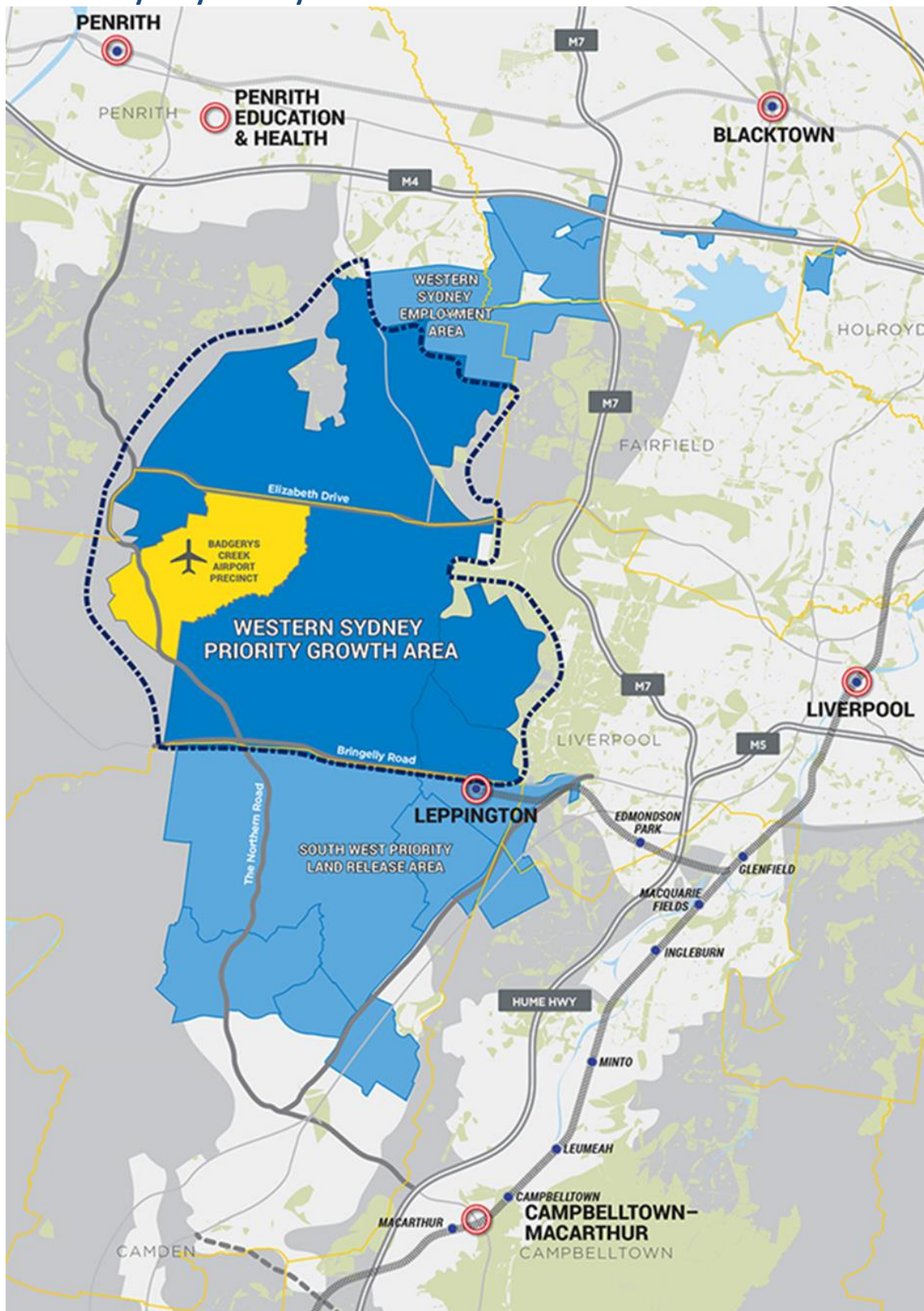
RDA Sydney Report

Strategic Industries Development around the Western Sydney Employment Area (WSEA)

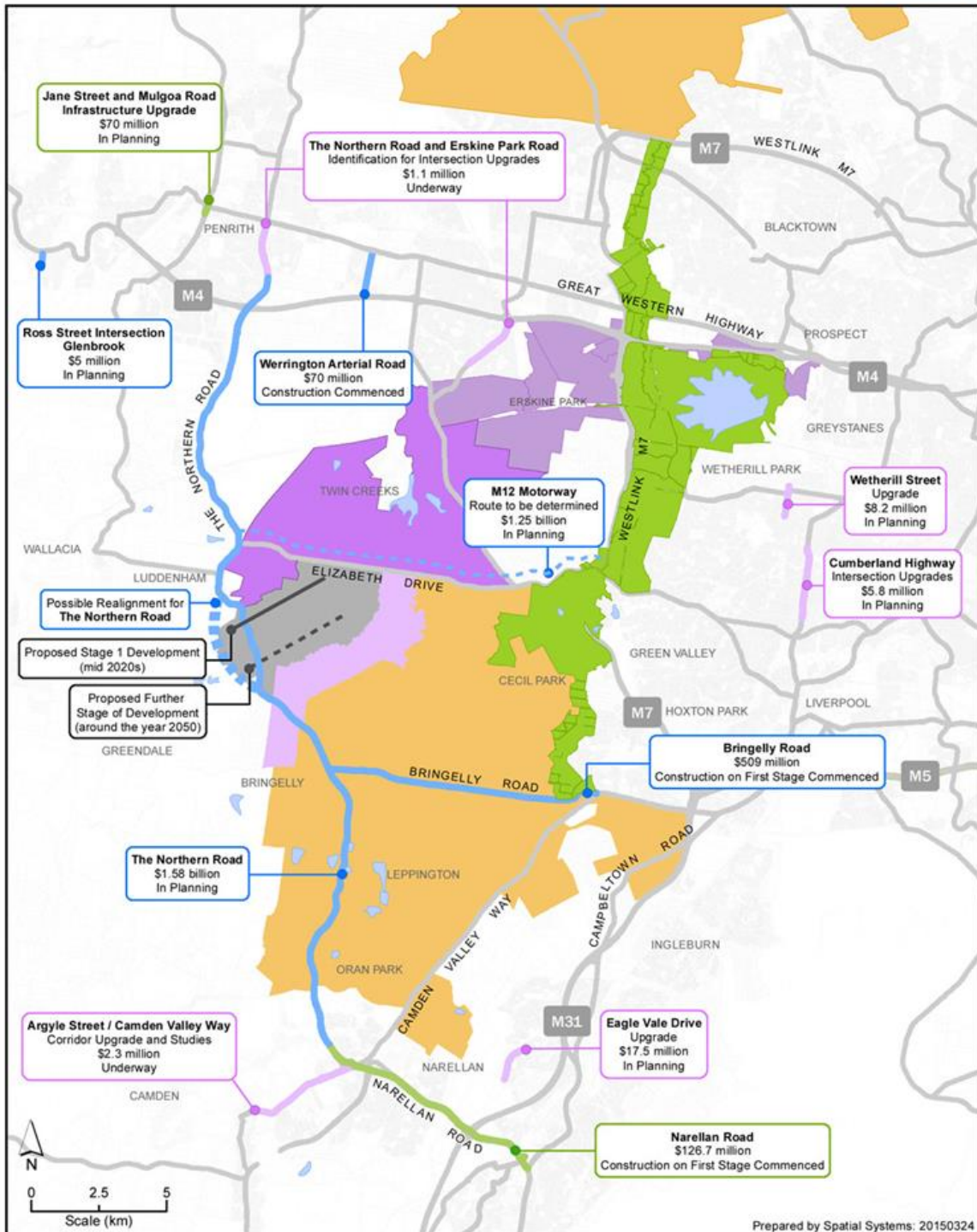
August 2016

Regional Development Australia Sydney brings together people to promote collaborative decision making for the sustainable and just economic development of Sydney, with a focus on employment growth.

Western Sydney Priority Growth Area¹



WESTERN SYDNEY - AIRPORT SITE AND INFRASTRUCTURE



FOREWORD

Regional Development Australia Sydney (RDA Sydney) has undertaken this project and written this report as part of its funding agreement with the Department of Industry within the NSW Government. The purpose, the objectives and the outcomes for the project were jointly developed and agreed with the Department of Industry and Regional Development, the NSW Department of Industry, Department of Planning and Environment and the Department of Premier and Cabinet.

The project itself has involved considerable independent desk research, submissions and industry development work that has been undertaken over many years by RDA Sydney in consultation and collaboration with many other strategic partners. It has also involved seeking feedback via survey and interviews from a diverse range of company and industry stakeholders within the initial industries that were targeted. Over 430 survey letters and emails were sent out to aviation and aerospace, life science pharmaceutical and medical technology companies, manufacturers and food and agricultural groups. In addition opinion was sought from our key partner groups- industry associations, government agencies, export industry associations, councils, universities, consultant groups and the airport industry.

Within the project framework and the time available, we were not able to survey all of the key stakeholders and gain input from industry representatives from all potential industries that should be considered. On the other hand we have uncovered through our additional desktop research, significant potential industry opportunities and interest by industry stakeholders to further develop via future workshops and taskforces the ideas raised in this report.

This work was commissioned as an input to the long term vision for Greater Western Sydney and to help provide a better understanding as to the potential part that a new Western Sydney airport and the long term industry development of the Western Sydney Employment Area could play around it.

This report provides input and recommendations for action that address the issues raised by stakeholders including, the necessary future policy settings by all levels of government, the necessary future industry development strategies, and identifies the spatial, land-use and transportation infrastructure required to maximise the future economic and social benefits of a 24/7 airport.

It is hoped that the findings and recommendations from this report will be used by both the NSW and Australian government agencies in the future planning of the second airport at Badgerys Creek and to help develop the potential industry development strategies and policies that will be critical for all levels of government to future masterplan the Western Sydney Employment Area. (WSEA) within the broader growth of Greater Western Sydney (GWS).

For further information regarding the findings of this report or to discuss any of the issues or recommendations under consideration contact Bob Germaine, Executive Officer, RDA Sydney via email at bob.germaine@rdasydney.org.au

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EXECUTIVE SUMMARY

The purpose of this project has been to identify and scope with key stakeholders, potential new strategic industry development activities in and around the Western Sydney Employment Area that could be developed, both directly or indirectly, based on existing or future supply chain capabilities and current/future growth opportunities with a new airport planned within the next 10 years at Badgerys Creek.

Greater Western Sydney (GWS) is one of the fastest population growth regions in Australia with 4 million out of 7 million estimated to be living in the region by 2051. At present there is major concern about Sydney being a more balanced, more equitable, and well-connected city of cities particularly with respect to jobs, transport and access to education, amenities and infrastructure. New industry growth is urgently needed to build a new innovative economy to support and maximize the national investment return around the future airport and simulate the growth of more higher-paid jobs closer to home.

The project itself has involved considerable independent desk research; submissions and industry development work that has been undertaken over many years by RDA Sydney in consultation and collaboration with many other strategic partners. It has also involved seeking feedback via interview and by our survey from a diverse range of companies and industry stakeholders within the initial industries that were targeted. Over 430 survey letters and emails were sent out to aviation and aerospace, life science pharmaceutical and medical technology companies, manufacturers, T&L association groups, and food and agricultural groups. In addition opinion was sought from our key partner groups- industry associations, government agencies, export industry association, councils, research groups, universities, consultant groups and the airport industry.

Within the project framework and the time available, we were not able to survey all of the key stakeholders and gain input from industry representatives from all potential industries that should be considered. On the other hand we have uncovered through our additional desk research, significant potential industry opportunities and interest by industry stakeholders to further develop via future workshops and taskforces the ideas raised in this report.

However we have been able to identify, liaise and scope a range of economic development growth opportunities with some of these current and potential key industry players, around existing and potential new industry capabilities, research institutes and infrastructure. We have also been able to instigate a starting point from which can develop with ongoing future work a framework in consultation with industry to work collaboratively around these opportunities.

Wherever possible, we have attempted to identify new potential industry innovation centres of excellence and clusters with potential for associated research/industry partnerships that can spin off into other economic opportunities, and also lay the groundwork for individual innovative business collaborative taskforces to encourage and stimulate new investment and job growth.

In our background research, we uncovered significant additional economic development opportunities for Sydney and Australia in having a second flexible 24/7 operational airport which boosts the air connectivity with the rapidly growing Asia Pacific markets. *ACI Europe - Economic Impact of European Airports (2015)* report the “catalytic impacts’ airports have in that countries with better air connections tend to benefit from increased trade, higher investment, more tourism activity and better productivity overall. Reports by Airbus and Austrade with respect to the online e-Commerce market changes in China highlight the rapid changes that are occurring now and the anticipated significant growth to 2034 in consumer wealth within the Emerging Economies – particularly in China and India.

This means that there will be progressively significant additional opportunities for trade and tourism, if both KSA and the new WSA airport are designed and upgraded to be internationally leading-edge in passenger and freight handling efficiency- helping Sydney maintain its Airbus *Aviation Mega Cities* status. The main point coming from our research however is that these opportunities are happening now across the range of potential strategic industries that we have identified, and will present themselves even more so over the next 5-15 years - long before the new airport is built!

Outlined below are some of the key future potential strategic industries and business opportunities that have been identified:-

Aviation –

- Design, build fit out and equip a world class leading-edge airport capable of starting small with one runway (10 million passengers per year) but growing rapidly over the next 30-40 years. Design and build a complementary road/rail transport network to maximise efficiency of the airport and the growth of GWS and WSEA as a whole.
- Develop major additional global aviation OEM supply and maintenance capacity and capabilities
- Further develop and grow Australia's international pilot, aviation industry, and aircraft engineering training industry
- Work with industry groups, clients and data centres to overhaul and rapidly improve the effectiveness and efficiency current air freight logistics to improve domestic freight costs and times out of Sydney.

Aerospace /Defence –

- Develop major additional global aerospace and defence OEM supply and MRO maintenance capacity and capabilities by creating a virtual collaborative industry cluster utilising the latest new materials and technologies.
- Develop a new Aerospace /Autonomous Space Centre bringing together the NSW industry and research autonomous and space industry capabilities and strengths.
- Establish a NSW Defence Science Institute (like Victoria) with industry and university research institutions, and the NSW Chief Scientist's office and DoI to accelerate opportunities nationally and internationally for NSW.

Transport & Logistics -

- Develop and effectively grow the T&L industry in GWS and in particular WSEA, which will see container growth of 3-4 times over the next 40 years.
- Create and build new supply chain efficiencies with the air freight industry, and design and build new additional intermodal terminals at Eastern Creek and ultimately at Badgery's Creek alongside the WSA airport.
- Create a new T&L collaborative virtual industry Centre of Excellence at Eastern Creek bringing together the NSW T&L industry and research capabilities and strengths.
- Build on existing capabilities a major smart supply e-commerce and warehouse equipment industry

Digital Industries –

- Build and develop the WSEA digital industry cluster in GWS as a whole - particularly around the data centres, around smart-ups, smart products and technologies IoT, B2B and Machine 2 Machine real-time automation systems and robotics.
- Build and expand the new collaborative creative digital industry *Piivot* cluster in inner Sydney around UTS to one covering all of Sydney including GWS - based on a *UCSD Connect San Diego* model *.(See Section 5.3 Best Practice – Connect San Diego)*
- Encourage the *technical innovation interconnectivity* between the digital industry and the other collaborative industry clusters in aviation, aerospace defence, transport & logistics, advanced manufacturing, pharmaceutical and biotech, agribusiness, food and beverage industries, and building and construction.

Advanced Manufacturing & Electronics –

- Create a new *Start-up Ecosystem for Manufacturing* in Sydney, whilst developing a major advanced manufacturing & electronics cluster model for Sydney -based on a *UCSD Connect San Diego* style model - *(See Section 5.3 Best Practice – Connect San Diego)*. This could be developed over a range of competitive industry streams covering all of Sydney including GWS.
- Build up investment and industry capability profiles, and a geographic/sector database of the leading manufacturing and research industry sectors. This would include the industry research and technology centres, and companies with leading-edge technologies and expertise.

Life Sciences, Pharmaceutical Research & Manufacturing -

- Workshop with key industry stakeholders, key new relocation and export opportunities and impediments identified in the report. Develop practical changes that could be implemented immediately to overcome the significant reported lost export opportunities - with respect to new streamlined customs and air transport freight systems, quicker response times, costs and expenses in accessing markets.

Biomedical/Bio tech/ Veterinary Products, Research and Testing -

- Workshop with key industry stakeholders, key new relocation and export opportunities and impediments identified in the report. identify practical changes that could be implemented immediately with our airport at KSA, and how we capitalize on this with a new 24/7 WSA airport- with respect to new streamlined customs and air transport freight systems, interim airport specialized refrigeration and storage facilities, quicker response times, costs and expenses in accessing markets.

Agribusiness Research/Food Packaging & Processing -

- Develop a *new collaborative virtual food innovation research and industry development cluster* with specialty streams, which build on the unique industry strengths and all of the key universities research capabilities of USYD, UNSW, UTS and WSU, and the CSIRO in Sydney.
- Encourage catalytic international research and high value commercial and residential project investment within WSEA - such as the Celestino Science Park.

- Workshop with key food and agribusiness industry stakeholders, key new relocation and export opportunities and impediments identified in the report. Form an export taskforce to develop practical changes that could be implemented immediately with respect to market facilitation and meeting facilities at KSA Sydney airport, new streamlined quarantine, customs and air transport freight and interim refrigeration and storage systems, quicker response times, costs and expenses in accessing markets.

Building and Construction Materials/Resources/Energy -

- Build on the current existing industry development opportunities by expanding the operations of the smart eco-green building materials and metal specialist industry design, manufacturing and research cluster near Bluescope Steel plant near Erskine Park
- WSEA, is home to a diverse range of environmental water, waste and resource recovery management and renewable energy companies. Opportunities exist to further develop these industries to accommodate Sydney's population growth.

RDA Sydney broadly endorses the sentiments and ideas expressed in the Kasada *Aerotropolis* book, and encourages the both the Australian government and the NSW government to broaden the Airport Plan's scope recognizing Western Sydney Airport as the beginnings of an Airport City, which will attract trade oriented investment, increase technology employment and attracting high-value real estate investment for hotel, attraction, office and international/trade uses.

Whilst it will be imperative for high speed connectivity for the new airport with Parramatta and the CBD of Sydney by rail and by road, the new airport city will need to be planned as an essential cog (with its own sense of place and character), as the catalytic central hub for the WSEA employment area as well as a key destination to and from each of these regional centres.

It will be critical that the long-term planned and staged implementation growth of the Airport City within the WSEA (and its relationship to the broader growth of GWS), be planned over at least 30-50 years, taking into account the time in the future when the airport second runway is operational and the changes that will occur over that time in overall population and employment growth of GWS. At the same time, it will also be critical to consider the way the rest of the Sydney metropolitan area will change with other major infrastructure changes being planned and implemented.

We would also recommend the utilization of a *Virtual Sydney* 3D model, similar to that currently being developed in Singapore, as part of the strategic planning project, to help in visioning, in developing alternative scenarios by simulation and what if analysis; so as to develop a better 3D Masterplan from which appropriate current zoning, spatial and transport corridor identification and infrastructure staging, could be developed.

Whilst KSA airport will remain as the leading airport gateway to Sydney for many years to come, the new *aerotropolis* for the WSA airport will need to build for itself an independent brand and reputation as vibrant leading 24/7 operational international airport city for Western Sydney. It is envisaged that the new WSA airport such as this will be able to differentiate itself domestically but also internationally, and entice additional tourists and business travellers (particularly from China and India) to Sydney from North Asia.

It is expected that the following additional business opportunities will need to be considered:-

- With more flexibility with respect to flight take-off and landing times, and more additional flights from new international carriers- it will bring additional tourists and business people seeking the convenience of staying for the day or overnight, attending a conference or doing business with Australian counterpart at the airport itself.
- More opportunities to host international trade shows, conferences and exhibitions, as well as a range of office facilities for business *face to face* meetings and financial trade activities.
- Because of the flexibility in flight times, our relative geographic position, and our relative mid-point 24 hour time position with North Asia (with respect to Europe and the US), the new WSA airport could become a new additional critical hub for trade facilitation, major business deals and project meetings.
- It will become a key additional international student, conference and research gateway for all of the potential strategic industry activities outlined in the other sections of this report.
- It will provide access to new and additional Western Sydney tourist attractions and experiences which could operate from the airport.

RDA Sydney welcomes the recent pre-election announcement by the Turnbull Coalition Government that if re-elected, the Federal Government would partner with the NSW Government in a new *City Deal for Western Sydney* to grow Western Sydney around the development of the new WSA airport.

RDA Sydney agrees with both governments that the *City Deal for Western Sydney* could and should become the single largest planning, investment and delivery partnership in the history of Australia, in that it addresses the two critical challenges for Greater Western Sydney - stimulating massive job growth and creating better transport links between the region and the rest of Sydney.

However we would also say that it presents a once in a lifetime opportunity for Australia, for Sydney to not only maintain its global aviation megacity status in the rapidly growing Asian Pacific region; but also allow us to innovate, meet the challenges of digital disruption and rapidly grow the economy, capitalizing on the unique on-line product and services export trade and tourism opportunities that will present themselves in new found emerging country wealth in China and India.

In saying this however, RDA Sydney believes there is much to be done, and has made a number of policy recommendations to both the Australian and NSW government which are outlined in detail in *Section 5.1 Policy Recommendations to Government*, and *Section 5.2 Further Work – Next Steps*.

It is hoped that the findings and recommendations from this report will be used by both the NSW and Australian government agencies in the future planning for the second airport at Badgerys Creek and to help develop the potential industry development strategies and policies that will be necessary for government to critical future masterplan for the Western Sydney Employment Area.

We have endeavoured to identify localized key industry development opportunities in the broader WSEA area around a timetable for a new airport, which can create greater access for SMEs to participate and improve potential for business growth, diversification and linkage to global players and their supply chains.

We hope and trust that it will assist the federal Department of Infrastructure and the new Greater Sydney Commission in gaining a better insight as to the necessary industry drivers needed towards planning, developing and implementing a more integrated economy around the new airport ready to support it when completed

Finally we hope that it will provide input and recommendations for action with respect to consideration of the issues; the necessary future policy settings by all levels of government, the necessary future industry development strategies, spatial, land-use and transportation infrastructure required to maximize the future economic and social benefits of a 24/7 airport.

About Regional Development Australia Sydney

Regional Development Australia is a partnership between the Australian, State and Local Governments created to strengthen regional communities. RDA Sydney is part of a national network of 55 RDA committees. These committees are made up of local leaders who volunteer their time to work with government, business and community groups to grow and strengthen their communities.

RDA Sydney's purpose is to build partnerships between governments, key regional organisations, local businesses, community groups and key regional stakeholders to provide strategic and targeted responses to economic, environmental and social issues affecting Sydney.

RDA Sydney has developed a Regional Plan for Sydney. It is based on inputs from stakeholders and draws information from 87 existing plans and reports published by the Australian, NSW and Local Governments and other key agencies. The Plan describes Sydney's attributes, industries, employment base and key advantages. The Regional Plan sets out the economic, environmental and social vision for the region, articulating the drivers of change, identifying strengths, weaknesses and opportunities, and listing priorities for action. It is a 'living' document which is updated annually and used by RDA Sydney and its Region to implement specific strategies (See www.rdasymdney.org.au).

RDA Sydney's recently updated strategic priorities are:

- Nurture innovation and industry development to get the right jobs in the right place.
- Seek to influence government policy to make Sydney a liveable city with affordable housing, amenity and improved well-being and social equity.
- Develop and promote 'Whole of Metropolitan Sydney' integrated planning capacity and tools.
- Develop RDA Sydney's organizational capacity to deliver successful outcomes through partnerships.

In this context some of RDA Sydney's priority areas of focus have been to:-

- Apply a Sydney regional lens to the application of federal/state policy and planning as a comparison to other states, and be the eyes and ears of government
- Engage with all stakeholders including each level of government, to create a whole of region identity and vision, identifying *Whole of Sydney* metro issues

Section 1 INTRODUCTION

Project description

The purpose of this project has been to identify and scope with key stakeholders, new industry development activities in and around the Western Sydney Employment Area that could build on existing capabilities and current/future growth opportunities, with the planned Western Sydney Airport at Badgerys Creek.

Why is this project needed?

Greater Western Sydney (GWS) is one of the fastest population growth regions in Australia (4 million by 2051), with major infrastructure and a second airport planned within the next 10 years.

New industry growth is urgently needed to build a new innovative economy to support and maximize the national investment return around the future airport and stimulate the growth of more higher-paid jobs closer to home.

Objectives of the Project

- Identify, liaise and scope a range of economic development growth opportunities with current and potential key industry players, around existing and potential new industry capabilities, research institutes and infrastructure;
- Capture and promote industry opportunities such as Western Sydney airport, new major roads, rail, intermodal infrastructure etc as they link to the selected industry sectors but also as they relate the adjacent regional cities, and the North West and South West Growth Centres;
- Facilitate targeted industry stakeholder group workshops to garner feedback and to test ideas;
- Develop a framework in consultation with industry to work collaboratively around these opportunities;
- Lay the groundwork for individual innovative business collaborative taskforces to encourage and stimulate new investment and job growth;
- Assist the federal Department of Infrastructure and the Greater Sydney Commission in gaining a better insight as to the necessary industry drivers needed towards planning, developing and implementing a more integrated economy around the new airport ready to support it when completed.

What are the expected economic benefits?

- Identification of localized key industry development opportunities in the broader WSEA area around a timetable for a new airport, which can create greater access for SMEs to participate and improve potential for business growth, diversification and linkage to global players and their supply chains;
- Identification of new industry innovation centres of excellence and clusters with potential for associated research/industry partnerships that can spin off into other economic opportunities.

Key Stakeholders

NSW Department of Industry (DoI)
NSW Department of Premier and Cabinet (DPC)
Department of Planning and Environment (DoPE)
Greater Sydney Commission (GSC)
Sydney Agriculture Strategic Approaches (SASA)
Department of Infrastructure & Regional Development
Department of Primary Industries
Infrastructure NSW, Urban Growth, Jobs for NSW
Deloitte -Shaping Future Cities-Designing Western Sydney Steering Committee
Western Sydney Airport Alliance (WSAA)
Sydney Airport Corporation (SAC)
NSW Business Chamber
Australian Industry Group (AiG)
Manufacturing Skills Australia (MSA)
Engineers Australia, Consult Australia
Committee for Sydney
WSROC
MACROC
City of Sydney Council
Greater Western Sydney Councils
Western Sydney Leadership Dialogue
DATA61/ CSIRO
Deloitte, KPMG, PwC, Ernst & Young
Aurecon
AAM Group
Sydney Aerospace Defence Interest Group (SADIG)
Royal Aeronautical Society (RAeS), Warren Centre
Universities- WSU, USYD, UNSW, UTS, MQU, UoW, and UoN
USYD- School of Aerospace, Mechanical & Mechatronic Engineering
Aerospace Developments Pty Ltd
Delta-V-Spacehub
Australian Industry Defence Network (AIDN- NSW)
Aviation Aerospace Australia, and Aviation /Aerospace companies
Australian Association of Unmanned Systems (AAUS)
Australian Centre for Space Engineering Research (ACSER)
South West Sydney Manufacturing Industry Taskforce
Western Sydney Business Connection
Manufacturing & Engineering Institute of Australia
Advanced Manufacturing Industry Growth Centre
Local Business Chambers
Urban Development Institute of Australia (NSW), Property Council
FIAL, Australian Food & Grocery Council of Australia, Sydney Markets
Reengineering Australia Foundation – F1 in Schools Technology Challenge
Hawkesbury Harvest, SPUN, Sydney Markets, food agribusiness companies
Australian Logistics Council, NSW Ports, ITLIS, Data 61/ Future Logistics Living Laboratory
Medicines Australia, Complementary Medicines Australia
Australian Automotive Aftermarket of Australia (AAAA)

Section 2 BACKGROUND

2.1 Western Sydney Employment Area

Greater Western Sydney has one of the fastest growing economies in Australia. Its population is expected to rise from 2 million in 2011 to 2.9 million in 2031. The NSW Government established the Western Sydney Employment Area (WSEA) as an area to set aside for industrial and commercial purposes that is serviced by strong road links and infrastructure at the M4 and M7 junction. This area will enable the region to respond to this population growth and meet the demand for new jobs.

In April 2014, the Commonwealth Government confirmed Sydney's second airport would be built at Badgerys Creek, near the Western Sydney Employment Area (WSEA).

In August 2014, the NSW government announced a proposal to expand the WSEA to dedicate a further 4,573 hectares of employment land to this already successful employment hub to deliver even more jobs for western Sydney. The WSEA extension, identified by amendment to the State Environmental Planning Policy (Western Sydney Employment Area) 2009 (WSEA SEPP), will increase the employment area boundary south to Elizabeth Drive and to include land west of the planned Western Sydney Airport.

For full detailed reports see <http://www.planning.nsw.gov.au/Plans-for-Your-Area/Priority-Growth-Areas-and-Precincts/Western-Sydney-Employment-Area/Documents>

The Broader WSEA is intended to help deliver the NSW Government's goal of delivering 50 per cent of Sydney's jobs growth in Western Sydney providing the opportunity for more people to work closer to home. Transport, logistics and warehousing have been anticipated to be the main emerging employment sectors utilising the Broader WSEA in the short to medium term while enhanced infrastructure will provide opportunities for higher density employment, such as business parks, in the longer term.

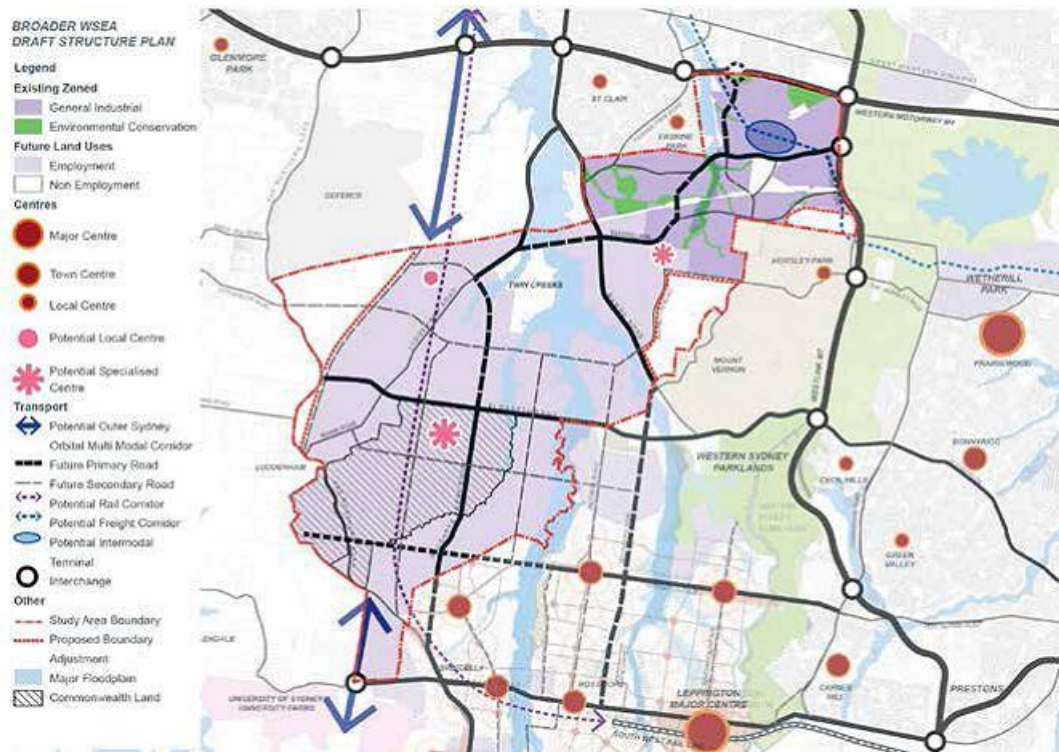
In 2013, the NSW Government released a draft Structure Plan for the Broader WSEA, which included a proposal for an expanded WSEA boundary. (See next page for Draft Structure Map for WSEA as at 2013).

Since that time further work has been progressively undertaken to refine the plan for the future development of the area and land around the Western Sydney Airport. At the time, the NSW government expected to deliver more than 36,000 industrial jobs and 21,000 office jobs over the next thirty years.

However with the go ahead for the second airport at Badgerys Creek, and the extension of the Western Sydney Employment Area, the NSW government is currently seeking to provide more than the 57,000 jobs predicted over the next 30 years, and the 212,000 jobs they had forecasted for the longer term.

Development in the Western Sydney employment area is governed by the [State Environmental Planning Policy \(Western Sydney Employment Area\) 2009](#).

Draft Structure Plan Western Sydney Employment Area (2013)³



Comments on Draft WSEA Employment Drivers & Land Use

Back in 2013, RDA Sydney noted in its submission⁴ to the NSW government that the Draft Structure Plan showed an availability of a total of 8100 hectares of employment land comprising 1750 hectares of zoned employment land within the existing WSEA and 6329 hectares of future employment land.

Our concern then with the *WSEA Economics Issues and Drivers* study⁵ undertaken at the time by Urbis for the NSW government, was that despite the overall demand for employment land varying 80 -300 hectares per annum for Sydney with an average of 186 hectares per annum over the previous 5-7 years, it only identified a potential demand of 2100 hectares in the study area for the next 30 years!

RDA Sydney still believe that this will be a major underestimation! Whilst we said at the time that it will take a major catalyst or government incentive to kick start demand to make it happen, we still feel that once it does, demand will take off and then supply of sufficient suitably priced zoned employment land will not be available progressively as and when required.

We also tabled our reservations at the time, to the realisable zoned employment land areas that would be able to be developed with the appropriate timely delivery of infrastructure at a competitive price to that offered in say Melbourne or outer areas of Brisbane. We believe that

the flood plain issues, riparian, ecological, topographic and environmental considerations outlined in the reports will reduce the nett available land more than that that has been outlined.

We also highlighted the need to identify and consider major infrastructure transport and land-use corridors for the future development of each of these major precincts, as they will have to be developed as a complete precinct, because no one individual developer will be prepared to take the up-front risks associated with trying to do it on their own.

At the time, the same *WSEA Economic Issues and Drivers study* also discussed separately the potential demand and drivers for employment land and for business parks, and reached a conclusion then that growth for the above jobs will only involve the need for one specialised centre at Baker's Lane and another possible specialised centre around Badgerys Creek with a new local centre near a potential rail station at Luddenham? In the light of the recent changes, the potential additional new opportunities identified later in this report, and the announcement by Celestino for a new Science Park at Luddenham⁶, RDA Sydney believe these previous recommendations need reviewing.

RDA Sydney still has a major problem with those same initial assumptions that necessarily the only likely demand for the broader WSEA would be in the freight and logistics areas, but we certainly agreed that incentives and intervention by government would be critical to stimulate and encourage sufficient magnet attraction technology driven centre growth required to make the whole effort worthwhile. With a decision and commitment by both the Australian and NSW government since then, to build an airport and provide the necessary funds to upgrade the local road infrastructure, we believe that this recent intervention and incentives given by government have provided a good start, but that much more will be needed!

In addition to the above, RDA Sydney would also like to re-emphasise the following observations made back then about other industrial regions of the world and re-make the following suggestions with respect to incentives and interventions:-

- World class industrial regions in Sweden, Finland, Germany , Italy, and Singapore have not emerged or exist without “ centres of excellence” within them where industry and leading edge innovation, science and technology support centres co -exist alongside major university or other supportive presence in the form of R&D clusters, and training facilities;
- In fact, as an example in Australia, in the Clayton industry precinct outlined in the attached photo from the paper *The Role of Precincts in Innovation Systems – by Dr Terry Cutler*⁷ he showcases just how the success of Clayton as an industrial precinct has organically evolved. Note: the presence of CSIRO, Monash University, and Support GSI Knowledge Centre. And also Professional services in the form of technology Management Consultants, ANZ and NAB Banking for local administration and retail support facilities;

- In the case of the Broader WSEA we suggested back then the potential of:-
 - New intermodal terminal with major T&L industry Centre of Excellence precinct at Eastern Creek, and supportive SME technology companies for all of the T&L precincts in GWS;
 - Building materials and metal specialist industry cluster precinct near Bluescope Steel plant near Erskine Park;
 - IT Data Centre cluster around Eastern Creek;
 - Environmental Water and Renewable energy cluster;
 - Bio energy, recycling and waste remediation cluster around the SITA waste site;
 - Aerospace and defence industry technology, sustainment and manufacturing facility;
 - Major agribusiness technology and commercial business park appropriately located within the study area;
 - And lastly but most importantly around a future second airport, could be another specialist centre with tourism, commercial banking, professional services, airport services, air /road/rail freight intermodal T&L facilities.

Each of the above potential projects suggested then were based upon the fact that there is already a significant industry presence and potential competitive position in GWS or elsewhere in Sydney which could be capitalised upon.

None of the above will happen unless we can get a further commitment by both the federal government and NSW government (from both sides of politics), that they are prepared to commit to some of these initial catalytic projects to kick start the process. It is hoped that as a result of the further development of these ideas and opportunities in this report, both sides of politics and all levels of government will see the benefits of making such commitments. Recent announcements, made from both sides of politics as part of the federal election, with respect to a Western Sydney airport, the importance of the future growth in Greater Western Sydney to the economy of Sydney and Australia as a whole, could provide just the opportunity.

[illegible]

2.2 Discussion on Economic Impact of a Western Sydney Airport

Much has been written by many authors about the economic benefits of airports generally and more especially an airport at Badgerys Creek in Western Sydney. For the purposes of our study into the potential strategic industries in the broader WSEA region, we have taken an overall macro strategic supply chain industry view in relation to the siting and location of businesses and research organisations in Sydney's targeted key industries as they are now and how they may and could change by 2030 with a new 24/7 airport.

As you will be aware, for the purposes of the technical report for the current Australian government EIS for the Western Sydney Airport⁹, the potential employment impacts were considered in three categories:

- Direct airport employment - including those persons that are employed at the airport to assist in the provision of its services. Direct employment at an airport typically includes administration and airport management staff, baggage handlers, airline staff, freight processing, retail operators, government operators, security and other services provided to customers;
- On-site business park employment - those industries directly supporting the operations of the airport (e.g. flight kitchens), services for airport employees and passengers (e.g. hotels, restaurants, tourism, car rental), as well as freight, high technology, manufacturing and finance / business related services;
- Off-site (flow-on) employment– The distributional effects on population and employment decisions in Sydney (and NSW), as businesses locate closer to the operating airport and people locate closer to employment opportunities.

In the context of our discussions we will cover the major opportunities with respect to both Direct and On-site business park industry for the WSA site itself, but in the main we will be focussing our attention to the broader surrounding economic development of the WSEA itself, and the broader implications for the economy of Greater Western Sydney and the global development of Sydney overall.

ACI Europe - Economic Impact of European Airports Report

In the latest Intervistas *ACI Europe - Economic Impact of European Airports Report* dated Jan 2015¹⁰ there is a very relevant discussion with respect to the total economic impact of European airports in respect to their catalytic, induced, indirect and direct economic impacts.
(See www.aci-europe.org)

They highlight in the report that what sets airports and associated aviation activities apart from most other sectors, is their ability to facilitate and generate wider economic activities, which boosts overall national economic performance. Countries with better air connections tend to benefit from increased trade, higher investment, more tourism activity and better productivity overall. These positive effects are known as the 'catalytic impacts' of airports.

They claim in the report that for every 10% increase in a country's air connectivity, GDP per person in that country increases by an additional 0.5%. Or to put it more simply, the more air connectivity you have, the wealthier you are likely to be. In the report they describe how each country has its own story to tell, but there are a few broad trends that affect countries to greater or lesser extents:

- **Islands and more remote countries** tend to have higher relative catalytic impacts – given the physical barriers of seas and oceans, or the sheer time and expense involved in accessing these areas via road or rail, air connections are crucial if these countries are to remain plugged into the global economy;
- **Countries with inbound tourism as a cornerstone of their economies** also tend to have higher relative catalytic impacts – only aviation offers the quick and affordable travel that underpins mass tourism in Europe. This effect is typically more obvious at 'sun destinations' countries within Europe;
- **The development of the aviation sector** within individual countries since its liberalisation also influences its relative importance to national GDP. Countries which enjoyed high growth in air connectivity as a result of new airline bases being established or increased hubbing activity for example, are likely to see the catalytic impacts of airports taking a relatively higher proportion of GDP.

The above factors can interact with each other in various ways, and allow a rough understanding of the broader trends influencing the varying levels of airport catalytic impacts. The report really highlights that the decisions that nations make, and the policies they choose to pursue, also play a significant role. It is no coincidence that Turkey – which sees aviation as a key strategic sector for its economy – tops their list.

As we know, each of the above trends apply to Sydney and Australia, with respect to our relationships to the Asian Pacific markets and the rest of the world! With Sydney as our global city, putting in place the right policy environment, that allows both our two international airports at KSA and WSA to grow their traffic and global reach, will help ensure that air connectivity has the maximum possible positive impact on wider economic growth for Australia as a whole.

The *ACI-Europe* report also states that the wider economic impacts, or 'catalytic impacts' of airports and associated aviation activity, are arguably their most important positive effect – they are certainly the impacts that distinguish aviation from many other sectors. Aviation's contribution to wider economic growth can be thought of via four main channels:

- **Trade** - Everyone wins when countries trade. Trade cannot happen without the goods being transferred between countries, and about 35% of the value of total traded goods globally is transported via air. In many sectors, transport across long distances via rail, road or ship simply takes too much time. Also airports and aviation play a key role facilitating the starting up of this trade in the first place by enabling the face to face meetings necessary to build up solid commercial relationships.
- **Investment**- As we *know*, emerging economies and key trading partners offer a potentially massive source of foreign direct investment. Face-to-face meetings are a fundamental component in the development of these relationships. But aviation also plays an important role in supporting the ongoing work that follows the investment. The everyday activity of doing business means that there is often a steady stream between regional offices and company headquarters, or indeed other regional offices around the world, as companies shuttle personnel to share knowledge and ensure managerial oversight.

- **Tourism-** Like their report found in Europe, Tourism in Australia plays a huge role in our economy. The activity generated by tourism, such as hotels, bars, restaurants and entertainment, are relatively labour-intensive, and often offer opportunities for workers with a diverse range of experiences and qualifications. This helps ensure that the impact of tourism is more widespread throughout the communities.

Air travel, they found has made possible the age of mass affordable tourism as we know it. Be it for longer distance trips, or just for city breaks, the time involved in getting from A to B via any other transport mode would simply rule most such trips out, before the financial expense involved is even considered. This will be a major factor in the potential progressive future growth of inbound tourism by affluent business and tourist visitors from India and China in particular.

- **Productivity-** Productivity, they found matters a lot. In the long-run, the economic growth of a country is driven by increases in the productivity of its workers, and all the more so in the context of globalised competition- by finding more efficient ways of producing the same outputs, or using innovation to create new technologies and products which did not exist before?

Airports and their network of destinations, they found reduce transport costs and increase destination options. At its most simplest, this increases the chances that the right workers are doing the right job at the right time, equipped with the right tools and the right qualifications – increasing their productivity and therefore their contribution to GDP.

Finally the *ACI-Europe* report also highlighted the following additional points which have relevance to Australian companies:-

- Air connectivity is not just the preserve of large multinational corporations. Like in Australia, more than 99% of European businesses are Small and Medium Enterprises (SMEs). They provide two thirds of all private jobs and are responsible for more than half the value add of the European economy;
- DHL found that the majority of SMEs expect to derive up to 50% of their revenues internationally by 2019, and that SMEs, that operated outside of their domestic G7 economies, were more likely to have average annual growth of more than 10% over the previous 3 years;
- SMEs, with a greater share of international revenue were more likely to be younger companies, and inadequate transport infrastructure ranked in the top 3 for main barriers for doing business;
- **Economic Growth vs Connectivity Growth** –There is an argument that is sometimes made that economic growth supports air connectivity growth rather than the other way around. The report says that this misses the point. Wider economic growth supports connectivity growth, but equally connectivity growth supports wider economic growth. The report contends that it's a **virtuous circle** – both depend upon each other.

Global Market Forecast- Airbus

In 2015, Airbus brought out a *Global Market Forecast 2015-2034*¹¹ report in which they have made the following predictions and assumptions:-

- World air passenger traffic will double in the next 15 years, with the rate of growth growing at 5.8% relative to the real world GDP growth of about 2.8%;
- There is a two speed economy operating- with *Emerging Economies* such as India and China growing at twice the rate of the *Advanced Economies*;
- Overall, it is estimated that the middle class population numbers in these emerging economies will grow from 2.7billion in 2014 to 4.7billion in 2034! Most of these people will come from India and China;
- The proportion of private consumption in emerging countries with respect to worldwide private consumption is estimated to grow from 31% in 2014 to 43% in 2034;
- By 2034, the propensity to travel will change to such an extent, that there will on average the following trips per capita: - India (0.3), PRC (1.09) compared with Europe (2.24) and North America (2.16)! As Australia is closer to Shanghai in flying time than London or Los Angeles, it presents an enormous opportunity;
- It will pay to be connected. At present, Airbus states that there are 42 *Aviation Mega Cities* (i.e. ones with >10,000 long haul passengers per day). By 2033 it is estimated that there will be 91 – they'll have more than 2.2 million long haul passengers a day. More than 95% of their long-haul traffic will be to, from or via other Aviation Mega Cities¹⁰. It's quite an exclusive club, and one worth getting into – together these cities will account for nearly 35% of World GDP!

However, membership is not assured – for example according to EUROCONTROL's outlook¹², all of the EU's Aviation Mega Cities are classified as having a level of airport infrastructure which makes it impossible for all of them to meet demand. These Aviation Mega Cities are facing a severe airport capacity crunch in the next 20 years, which will result in significant lost opportunity. With a new additional flexible Western Sydney airport, Sydney and Australia have an opportunity to attain the full benefit.

Growth in Online E-Commerce

The growth in online e-commerce particularly in the Asian Pacific region will present some significant new overseas trade opportunities for Australian companies.

For example, according to the Austrade *E-Commerce in China- a Guide for Australian Business*¹³, the take-up of e-commerce in China is not driven by PC shoppers, but by consumers using their mobile phones. According to the China Internet Network Information Center (CNNIC) in 2014, as quoted in the Guide, 520 million Chinese accessed the internet via smart phone from a total population of 632 million internet users. The PRC Chinese government target is to connect 1.2 billion people (85%) of the population to 3G or 4G mobile phone systems by 2020.

Business to Business (B2B) e-commerce is also growing rapidly due to its low costs and accessibility of information. According to *China Internet Watch-Online B2B Market*, as quoted in the Guide, China's B2B market reached USD \$1.2 trillion in 2013, with an annual growth rate of approximately 20% p.a.- the main items are food, raw materials , clothing and accessories, with Alibaba's www.1688.com having 40% of the market share. According to McKinsey estimates (as

quoted in the E-Commerce in China guide), as a result of these technology changes and rising incomes the upper middle class in China will account for over 54% of households by 2022.

The Austrade *E-Commerce in China- a Guide for Australian Business* report goes on to say that the availability of branded products has not kept up for this growth in private wealth, and that there is greater trust in perceived *foreign-branded* products bought online via Tmall, JD.com and Yihaodian. Another reason given for this new demand, is that they do not have major retail stores which are easy to get to and with the range of product choices that they all want. For example, in the more progressive 1st tier cities such as Beijing, Guangzhou and Shanghai, heavy congestion is also a factor in the buying decision. As their wealth increases overseas food, health and medicinal products, education and travel have become more fashionable and in demand.

Interestingly, the report also highlights that in 2014, the proportion of Australian products bought online via Taobao & Tmall sites in China was- skincare (40%); food & wine (19%); shoes and clothing (15%); and health supplements (6%).

2.3 Leveraging Economic Development around Airports

Like many others, RDA Sydney is firmly of the view that in order to leverage the optimum economic development outcomes from a new airport it is imperative that one develop an overall vision and macro-regional business strategy that encompasses the planning and growth of not just the airport itself but the overall future economic and social development of the region itself.

In that light, we have included a very interesting article written by Adam Wasserman and Jim Brogan from Global Logistics Development Partners¹⁴ about the keys to leveraging economic development at and around airports to illustrate the point.

“Four Keys to Helping Economic Development Soar through Airport Investment District Planning

Airport Investment + District Planning = Economic Development

Airports support a range of business needs for their communities, including long distance professional travel, access for local shippers and customers to national or international markets, and even serving as centers for regional collaboration and training activities. Yet transportation planning and regional economic development activities often exclude or under-emphasize airports.

The fact is, statewide and metropolitan mobility plans must accentuate the links between transportation investments and economic development strategies, so planners need to understand how airports fit into the freight transportation system and how airport investments, when strategically conceived and implemented, can help integrate vital transportation, trade, and economic goals.

So here are the four points that planners and economic development professionals must keep in mind about the relationship between airports and economic development:-

#1 Airports Play Critical Roles in High-Value Global Supply and Distribution Chains

Airports and air cargo services play an increasingly crucial role in a range of dynamic global supply chains.

Air cargo typically tends to transport relatively high-value and small or lightweight goods, products that generally require advanced skill input and thus provide high-impact economic development targets. These supply chains require high velocity transport and seamless, reliable logistics.

Some of the products well-suited for air cargo include electronics, pharmaceuticals, medical devices, automotive, industrial machinery and aerospace components, and apparel. These sectors may overlap; for example, the Korean-made touch capacitive electronic screens used in Ford Explorers leave Korea in the morning, land in Anchorage, Alaska for a technical stop and then go on to Chicago, in all, within 17 hours, including the truck-to-plant transportation. As high-value inventory items, these screens require near just-in-time importation to avoid the unnecessary cost of carrying onsite inventory.

Lesson learned:

Certain supply chains prize proximity to air service, making a location near an airport with direct or connecting service an economic development asset. Not every airport can serve as a cargo or major cargo facility but, for those with the capacity and access to markets, becoming a major cargo airport could provide further economic opportunity. For smaller markets, expedited or contract carrier service can offer connections that are critical for economic opportunities such as attracting high-value manufacturing.

Though major load center airport represent valuable investment locations, for a variety of reasons not every company will need or want to be located at or around a major cargo gateway, so understanding the value and limitations of feeder-connectivity to international cargo service is vital.

#2 An Efficient, Well-Connected Airport Supplies a Competitive Advantage

Because they provide feeder and direct air service connections, national and global economies benefit from airports as integral economic development elements. Site selection and supply chain sourcing professionals gain tangible competitive advantages from inbound and outbound air service to key markets.

This value especially impacts business sectors that need or require seamless connections between key supply chain markets. Many of today's most valuable supply chains--such as movement of auto parts between Seoul and Atlanta, pharma between Indianapolis and Birmingham, UK, and even fresh lobsters between Bangor, Maine and Paris, France--require frequent and predictable connections.

With an understanding of how an airport fits within national and global supply chains, in the context of other regional competitive factors such as the business climate and workforce, we can support growth of air service route development while delivering strong intelligence to help attract investment at and near airports. Air connections between markets, as well as efficient surface transportation links from airports to critical locations and facilities, impact development of both cargo and passenger investment.

#3 Start with the Airport City

With industry's (sometimes very fast) changing demand drivers, we can gain competitive advantage by artfully integrating transportation connectivity and infrastructure, along with an investment attraction strategy, into a regional freight planning/economic development effort. Some regions have begun to recognize this potential, but the work is mostly at the conceptual stage. Planning circles have begun to discuss airport city strategies, which incorporate consolidated business and planning strategies.

Although airport city planning strategies remain largely planning exercises, they offer good starting points. Through such work in Denver, Atlanta, and Dallas, airports and their surrounding regions are beginning to identify how to integrate the joint objectives of airport planning, air service development, infrastructure planning, and economic development.

While examples already exist of economic centers emerging around or near airports, some now talk about taking this to a distinctly new level.

- *The Washington Metropolitan Airports Authority, for example, looks to build out from the substantial high-tech/aerospace/government contracting business base around Dulles International Airport, to produce investment sites that could support a far broader range of businesses than now populates the Dulles Toll Road.*
- *In Birmingham, UK there are plans to integrate high-speed rail investments with land development planning, airport growth and onsite investment attraction. And well-passed the planning stages, many people will have read about Dubai's World Central project which takes planning, development and transport to an entirely different level.*

A thoughtful airport-vicinity development plan can help trade-oriented investment attraction, increase technology employment and attract high-value real estate investment for hotel, attraction, office, and international industrial/trade uses. Regions that adopt airport city strategies can realize economic benefits extending throughout the major metropolitan region and surrounding towns.

#4 Use it or lose it

Many airports sit on underutilized land assets that are ripe for development, for both aviation and non-aviation uses. While airports exhibit justifiable caution about approving long-term uses, many businesses prize airport locations and this demand will increase.

When developing this land into commercial or industrial real estate that supports industries relying on air cargo, it is vital to enhance truck access and to improve traffic and travel times with corresponding improvements to the transportation corridors moving in and out of the airports. This represents an opportunity to grow airport revenues as well as generate economic opportunity, but only when the airport and its regional partners collaborate on these activities.

Beyond on-airport assets, there are even wider opportunities for assets near the airport. Though likely not quite as valuable as on-airport sites, these properties also can prove highly strategic.

Tomorrow's global commerce picture increasingly necessitates strong links between transport and economic development. The question is, how can we create the necessary linkages among regional transportation investments, regional economic development strategies, and airport planning?

- *Economic developers must identify the key competitive niches of their markets and of the goods moving to, from, and through their regions today.*
- *Transportation and land use planners must better understand how the existing and potential regional industry mix views the importance of efficient air service, as well as the current performance and needed improvements of the airside and landside system.*
- *Strong regional leadership is required to develop business partnerships among airports, economic development organizations, municipalities, metropolitan planning organizations, and the private sector, so each party can contribute to developing airport districts as business hubs.*
- *Global growth in the business sectors that require speedy connections between important supply chain and business hubs will go beyond connections to the largest load center markets like New York and Paris. Air connectivity can equalize facility location options so other markets can compete for investment in new ways.*

The four key concepts outlined above can help to realize the full market potential and competitiveness of a region. Use this framework to build a strong business case for enhanced passenger and cargo service as well as onsite and off-site investment attraction opportunities. The relationships are in place to pursue these opportunities to maximize economic growth potential “.

In this RDA Sydney report we have endeavoured to identify the future market potential of some targeted industries around a future airport, the transportation links and the potential economic development opportunities. We hope that our work will help the overall planning process and be incorporated into the detailed development of an airport masterplan which includes land-use, road-rail transportation, communication and utility infrastructure in the WSEA on and around the new airport.

2.4 Background Research by RDA Sydney

As stated previously RDA Sydney works with all levels of government, industry groups, business, research and development, education organizations and community representatives to identify the needs and opportunities of Sydney, to facilitate the development of new ideas, projects and initiatives that create economic, social or environmental outcomes across the Sydney regions.

With respect to this project, we have undertaken the following scoping and reviewing work reflecting on the key priorities for the Greater Sydney region, but building on the current collaborative knowledge and networks already established by RDA Sydney in the past:-

- Significant desk research on international reports with respect to past and current future economic development and possible industries around airports in Europe, the US and the Asia Pacific;
- RDA Sydney has been one of the founding members of the *Western Sydney Airport Alliance* - a coalition of community groups, business and trade unions that support the development of a second Sydney airport in Western Sydney at Badgerys Creek. See www.westernsydneyairportalliance.org.au;
- Drawing on various Australian government airport reports, Western Sydney Airport Alliance and Business Chamber Western Sydney airport reports prepared by Deloitte, GHD, Urbis, Aecom, Aurecon, Kasardis and Ernst and Young; and also other reports prepared for the Western Sydney University (WSU), Liverpool and Penrith Council;
- RDA Sydney participated in a series of workshop *Think Tanks*, led by AECOM on behalf of NSW Planning (DoPE), and has made submissions regarding the *Draft Broader Western Sydney Employment Area Structure Plan*;
- Reviewing the Draft Western Airport EIS Report and submissions, the latest Infrastructure Australia Infrastructure Plan and Priority List, current Infrastructure NSW reports and submissions made by other major stakeholders and RDA Sydney in the past;
- Reviewing background notes, reports and submissions prepared as part of the Broader Western Sydney Employment Area Structure Plan, Employment Land Taskforces, Sub-Regional Strategies, and past and current NSW government metro strategies – including the current *A Plan for Growing Sydney-2014*;
- Drawing on input and expertise provided in workshops and conferences run by the Western Sydney Business chamber, the Western Sydney Airport Alliance and the Royal Aeronautical Society;
- RDA Sydney has facilitated input from key stakeholders by organizing T&L industry forums for the development of the *NSW Freight & Ports Strategy*;
- RDA Sydney wrote a submission and was asked to contribute to Supplementary Questions by the NSW Government's Standing Committee on State Development on the *Inquiry into Regional Aviation Services*;

- Drawing on industry background experience from SADIG members. RDA Sydney is the founder and facilitator of the Sydney Aerospace and Defence Interest Group (SADIG), a collaboration of industry groups which together has attracted over 200 member companies, to pursue further development and opportunities for aerospace and defence industries (See www.sadig.org.au) ;

SADIG facilitates companies and key government agencies to come together on a collaborative basis to share information, knowledge, expertise and future applications of technology. Where there are opportunities for advanced technology applications at airports, or clustered activity for aviation manufacture, repairs, maintenance and operations, the SADIG aerospace and aviation stakeholders have capability for significant economic impacts.

RDA Sydney also works closely with the Australian Department of Defence, Department of Science & Technology (DST), DATA 61/CSIRO, 8 different NSW university research groups, the Warren Centre, the Royal Aeronautical Engineers, the Royal Aeronautical Society and Aviation-Aerospace Australia;

- Capitalising on the input learnt from the activities of the *Supply Chain, Composites, Autonomous* and *Space 2.0 Forum* working groups as part of SADIG;
- Capturing the recommendations made in the UNSW- *Future of Aircraft Maintenance in Australia* 2015 report;
- Updating and reviewing the latest *RDA Sydney 2015 Economic Baseline Report* prepared by AEC group and the previous Greater Western Sydney Economic Development Board (GWSEDB) *2008 Economic Development Profile* which highlighted the major industry supply chain sectors, and employer companies by LGA in Greater Western Sydney;
- Capturing input and reports with respect to activities around the development of the Health and Education precincts developed by RDA Sydney, Liverpool, Penrith and Parramatta Councils and our involvement as part of the Steering Committee on the Deloitte-led *Shaping Western Sydney Cities Project*;
- Drawing on numerous Innovation and Smart cities reports, workshops over the last 2-3 years – particularly about the future, the location of smart work centres, centres of excellence, and the impact of digital disruption;
- RDA Sydney project managed the development of a 3D *Virtual Sydney* Proof of Concept Planning model for Sydney by the AAM group to advocate the benefits to government of utilizing 3D technology as a communications and complex planning tool for strategic and urban development. This Virtual Sydney digital model is currently being upgraded for RDA Sydney by AAM with the latest aerial data for Metropolitan Sydney including the Blue Mountains, capable of being used for future *what if* strategic planning, economic, transport and spatial land-use modelling;
- And finally utilising the feedback gained from numerous discussions and workshops with industry bodies, transport and logistics companies and university research groups. The recent RDA Sydney facilitated industry Forum on the Impact of Digital Disruption on Industry at the Re-engineering Australia Foundation *National F1 in Schools National Final*

has proved a good test as to the viability for potential opportunities for smart technical industries around a future airport.

This report also underpins RDA Sydney's objective of growing existing innovation precincts and improving access to markets - trading partners, clients and labour, in order to allow competitive industries to grow and increase the availability of goods and services. Airports and their associated infrastructure are an intrinsic part of access to markets and important contributors to the local economy.

The following RDA Sydney, stakeholder and topic expert documents have provided key inputs into this report:

- *Regional Development Australia Sydney Employment Lands Policy Position June 2012. Prepared by Johnston Enterprises Australia Ltd.*
- *Regional Development Australia Sydney Submission to the Draft Western Sydney Employment Structure Plan 2013.*
- *A Greater Global City Sydney 2051. RDA Sydney, Consult Australia & 10,000 Friends of Greater Sydney.*
- *Joint study on Aviation Capacity in the Sydney Region. Report to Australian and NSW Governments.*
- *NSW University's Final Report to South West Western Sydney Manufacturing & Engineering Skills Taskforce – A. Junor & D. Fraser IRRC UNSW Business School.*
- *NSW state government's A Plan for Growing Sydney.*
- *Liverpool City Council's – Badgerys Creek Airport Sydney's Innovation and Logistics Hub.*
- *A Western Sydney Aerotropolis – maximizing the benefits of Badgerys Creek. Commissioned by Sydney Business Chamber, Arab Bank and Liverpool Council. Prepared by John D. Kasarda, Director, Center of Air Commerce, UNC Kenan-Flagler Business School.*
- *Deloitte Access Economics Economic Impact of A Western Sydney Airport commissioned by NSW Business Chamber.*
- *Peter Marosszeky, Aerospace Developments Pty Ltd*
- *Urbis Broader Western Sydney Employment Area Economic Issues and Drivers Study – April 2013.*
- *Four Keys to Helping Economic Development Soar through Airport Investment District Planning. Article written by Adam Wasserman Global Logistics Development Partners LLC and Jim Brogan Executive Vice President Cambridge Systematics.*
- *The Social and economic Impact of Airports in Europe. Airports Council International/ York Aviation.*
- *White Paper The Aerotropolis Concept for Badgerys Creek. Matt Coetzee – Aurecon.*
- *The Case For Badgerys Creek. Bob Meyer – Cox Richardson Architects and Planners*
- *Hubs of the future: An integrated mobility network for passengers and freight. Siemens.*

- *Connecting Australia _The Economic and Social Contribution of Australia's Airports. Prepared for Australian Airports Association. – Deloitte Access Economics (2012)*
- *The role of precincts in innovation systems – a discussion paper by Dr Terry Cutler (2009)*
- *Economic Impact of European Airports – A Critical Catalyst to Economic Growth, InterVISTAS (January 2015)*
- *Mapping Demand 2016/2035 – Global Market Forecast, Airbus*
- *E-commerce in China: A Guide for Australian Business*
- *20 facts about air freight Sydney and the Sydney Airport(s), Anett Faustmann (August 2014)*
- *Aviation Infrastructure Industry Capability Directory 2010, Austrade and ICN*
- *Future of aircraft maintenance in Australia: Workforce Capability, Aviation Safety and Industry Development, Hampson, D Fraser, M Quinlan, A Junor, S Gregson (October 2015)*
- *Sydney Airport Master Plan 2033*
- *NSW Freight and Ports Strategy, November 2013*
- *Navigating the Future NSW Ports' 30 Year Master Plan, NSW Ports (October 2015)*
- *NSW Long Term Transport Master Plan, Transport for NSW (December 2012)*
- *Industry Action Plan: NSW Digital Economy, NSW Digital Economy Industry Taskforce (September 2012)*
- *Sydney and New South Wales: Australia's ICT and Digital Capital, NSW Department of Industry (May 2016)*
- *Innovation in Motion: Connect Annual Report 2010, University of San Diego*
- *The startup economy: How to support tech startups and accelerate Australian innovation, PwC – commissioned by Google Australia (April 2013)*
- *Medicines Australia Facts Book 4, Medicines Australia (July 2015)*
- *Australia in the Asian Century White Paper, Australian Government (October 2012)*
- *Scientific American Worldview: A Global Biotechnology Perspective (2016)*
- *The Australian Green Building Industry: Your Green Partner, Green Building Council of Australia (2011)*
- *Aerotropolis: The Way We'll Live Next?, John D. Kasarda and Greg Lindsay (2012)*

Section 3 TYPES OF POTENTIAL NEW BUSINESSES IN BROADER WESTERN SYDNEY EMPLOYMENT AREA

3.1 Aviation Industries

Sydney is Australia's internationally recognized global city, one of the world's leading sought after tourist destinations. It is the gateway to NSW and the largest city in Australia.

According to an article in 2014, about Sydney's airports by Anett Faustmann¹⁵, "Sydney's Kingsford Smith Airport is Australia's largest international airport, with 50% of international air freight being handled at Sydney Airport. In 2012, about 850 flights arrived or departed every day, which totalled 310,000 flights a year. It is the busiest airport in Australia, connecting Sydney to 46 international, 23 domestic and 28 regional NSW destinations (June 2009). It directly employs 75,580 people (full and part time), adding indirect employment of 130,550 jobs this totals in 206,130 jobs".

The building of a brand new second Western Sydney Airport for Sydney present huge challenges but at the same time incredible opportunities - to build a world class leading-edged designed international airport which can show off Australia's competencies to the world.

Having said that, it is imperative that we take the opportunity now to build an economy around the airport which utilises the best available designs and technologies, but helps the restructure of Sydney into a more balanced, sustainable, and liveable polycentric city, with several well connected thriving city centres.

We should therefore use the opportunity to support and develop, not only the strategic industries that will be needed in the building of this airport, but also the major potential future innovative industries of tomorrow both within Australia and internationally.

Airport Design and Equipment

We can and should encourage an export airport design & engineering and equipment industry capable of chasing the reputed 40% world growth in airports in particularly in the Asia Pacific.

According to the Austrade *Aviation Infrastructure Industry Capability Directory 2010*¹⁶, Australia's strengths in design, research and development, master planning, engineering, construction and IT have been successfully used to build airports and associated urban developments in Australia and globally.

Australian noise and environmental monitoring systems have been incorporated in most of the world's major airports and cities including London, Los Angeles, Hong Kong and Dubai. In addition, technology from an Australian firm is used in managing approximately 80 per cent of the world's oceanic airspace.

Australian businesses also offer cutting-edge baggage handling and lighting systems, perimeter and landside security systems, and airport construction and project management technologies and services.

Air Services

We should seek to maximise opportunities to supply and support the new Western Sydney airport but also export product and services to the rapidly growing Asia Pacific aviation market:-

- Advanced Navigation Equipment – The Navigation Aid Equipment for the airport will need to support the latest all weather landings as fog at times will be a problem. The development of the systems required here in Australia will be useful in developing and selling similar systems overseas;
- Support and maintenance of this equipment;
- Air Services Fire Fighting and Rescue products and services;
- UAV Control Centre Unmanned Aerial Vehicles – these will be very prominent when the airport is fully developed and Control Centres at airport precincts have been found to be very important for the safe and controlled use of these devices. (See more in-depth discussion later in Aerospace/Defence section.)

Aircraft Maintenance

According to *The Future of Aircraft Maintenance in Australia 2015 Report* by UNSW¹⁷, “By 2025, there will be an estimated 30% global workforce shortfall in aircraft maintenance capacity, with Australia and the Asia Pacific region particularly hard hit. Australia has an excellent international reputation with respect to air safety, and the development and training of aircraft engineering and trades technicians. There is a wealth of practical experience in the maintenance of all types of aircraft both new and old. With this back ground, there is an excellent opportunity to recapture this expertise and develop a new generation of young engineers and apprentices able to make up this shortfall in the region”

The Report concludes “This would mean moving quickly to rebuild both our aircraft maintenance and maintenance training industries by 2020, to permit Australia to handle a high proportion of its own needs across the civilian airline, general aviation and Defence sectors. There is also a great opportunity to capitalise on our strong safety standards and high-end maintenance capability by building a maintenance and training capacity, capable of competing aggressively in the highest-value niches of the global market”.

Practical CASA certified training projects developed with TAFE for apprentices, such as the Historical Aircraft Restoration Society (HARS) project in Albion Park or at TAFE SWSI Padstow will be critical to both promote the potential opportunities for the industry, but also encourage students become interested and take up the necessary STEM skill training.

It has been suggested by Peter Marosszeky, one of our SADIG airport consultants (Aerospace Developments Pty Ltd), that the aircraft hangars would need to be of sufficient size - capable of supporting the largest aircraft with associated support equipment built in for maintenance and repair of current and future aircraft. As this airport will be 24/7 operational, it will need to be capable of handling these aircraft from the start, with opportunities to handle additional future long haul major carrier maintenance.

Air Freight

Currently, according to the previously quoted 2014 article about *20 Facts about Freight at Sydney's Airports* by Anett Faustmann¹⁸, it reports:-

- Sydney Airport handles \$36 billion in air freight, and contributes \$8 billion in NSW Gross State Profit. Including associated services this number bumps up to \$16.5 billion;
- 80% of all air freight is carried by passenger aircrafts, 20% by dedicated freight aircrafts;
- Air freight exports are dominated by perishables (fruits and vegetables) and manufactured goods;
- Air freight imports are typically high value urgent manufactured products such as computer and vehicle parts.

In addition, the growth expectations of air freight and the Sydney Airport are significant. The current Sydney Airport Master Plan¹⁹ forecasts:

- Air freight volumes are expected to increase by 85%. The Sydney Airport is expected to move an additional 480,000 tonnes of air freight in 2029, increasing from 595,000 tonnes in 2009 to 1,100,000 tonnes in 2029;
- Over the next ten years the Airport is expected to generate about 100,000 additional jobs as a consequence of increasing passengers, freight, retail and commercial business;
- At both the international and domestic terminals, the airport takes up 240,000 square meters of commercial space, including 25,000 square metres of general retail space;
- In 2033, an estimated 388,000 passenger aircraft movements are expected;
- Total air freight is forecast to grow from 615,378 tonnes (2012) to 1,011,312 tonnes (2033) with an average annual growth of 2.4%. (Approximately 80% of this air freight is international as against domestic air freight);
- The NSW government has a program as part of the "NSW Freight and Ports Strategy"²⁰ in place that aims to increase and optimise the landside movements to support efficient air cargo logistics to and from the Sydney Airport.

Ultimately the potential air freight movement in and out of a new airport will depend on the future demand for air freight in Western Sydney as well as the relative plane freight carrying capacity of the international/ domestic passenger planes.

For this reason, new *Air Freight* terminals will need built-in flexibility for rapid capacity growth. We anticipate that there will be considerable pressure from new manufacturing and service industries that will set up in WSEA, and the major transport and logistics industry distribution companies operating around Penrith, Blacktown, Eastern Creek and Liverpool, for additional air cargo capability.

Livestock Transport

It has also been suggested by Peter Marosszeky from Aerospace Development, that a section of the air freight terminal be capable of processing export and import traffic, including livestock a growing and major export business. Livestock corralling and penning as well as appropriate quarantining facilities, would be needed therefore in the surrounding vicinity of the airport to allow the loading and yarding of export livestock.

Ground Support Equipment

The new airport will need facilities for maintenance and repair as well as storage of equipment. NSW has several internationally capable designers and suppliers of ground support equipment – baggage handling, signage, mobile freight scissor-lifting gear e.g. Nepean Bliss-Fox, A.D.McCallum, Byron Aviation, Forgacs-Broens, and Varley. It has been suggested by one of our consultants from the Western Sydney Airport Alliance Matt Coetze that an opportunity perhaps exists to develop a new export-oriented ground equipment systems design/supply cluster integrated with airport design architects - ie design the new airport around a brand new baggage handling solution?

International Training, Research and Educational facilities

Australia, and in particular Sydney are already renowned for their training of international pilots, administration management staff, engineers and technical service people. The University of Sydney and University of NSW currently have many international training programs in operation. In addition within the eight top universities within NSW there is significant aerospace research skills capability.

With a 24/7 airport operation there would be an additional opportunity to develop a new collaborative university centre of excellence campus with integrated testing and maintenance facilities to provide the *fly-in fly-out* practical on-the-job training for Australian and overseas undergraduates. This would of course include flight training facilities for international pilot training.

Airline Technical Offices

Initially it is anticipated that most of the current domestic airlines and some of the well-known international long-haul full-fare and low-cost carriers operating out of KSA would seek to also operate out of the WSA airport.

Bearing in mind as to the potential additional air passenger traffic from the Asia Pacific market - particularly China that has been outlined before, it is interesting that recently two China owned Groups (the Nanshan Group and the HNA private airline group), have bought a 39.97% stake in Virgin airlines. We expect that these changes could potentially continue, and that a 24/7 operational airport will encourage more airlines to come to Australia, thus bringing in significantly more new business and competition.

Over the next few years it will become more evident as to what the long term position will be. Progressively, as the WSA develops, more and more airline technical offices will need to be opened for supporting individual carrier engineering, operations and administration support.

Business Executive Jet Services

Currently there are several international and Australian-based business executive jet services for business passenger traffic operating out of KSA and Bankstown airports. It is envisaged that proximity to the CBD of Sydney, high speed rail connectivity, and international and

domestic flight interconnectedness will continue to be an important consideration with respect to client use and operations of business executive jet services.

Flights and Sydney CBD interconnectivity, convenience and cost are key factors in the location and operations for these business jet services. Ultimately it would be anticipated that there would be a spread of business between KSA, Bankstown and WSA.

As more and more business will be done in Western Sydney in the future, with the greater flexibility of night flight slots around 24/7 operations, it is expected that many more international business jet services and private jet charters will take up the opportunity of locating at the new Western Sydney airport.

Security Services

Cybersecurity and airport security are now key elements in the functioning of international and domestic airports. Thus the new airport will create a need for the latest security and surveillance products and services – which will create significant additional business for this industry in Australia, with the prospect of export sales to other international airports. Secure areas for military and bomb scare aircraft parking will be needed.

Emergency/Disaster Response.

At the moment the major ADF defence disaster aircraft response effort is concentrated out of the Richmond Airport base. Progressively the long term future of Richmond, KSA, Bankstown and WSA airports will need to be considered with respect to Australia's Disaster Relief Hub (aircraft repair, supply stockpiles, training).

As the WSA airport will be situated adjacent to the Blue Mountains and Warragamba Dam it is anticipated that new opportunities will arise for additional UAV autonomous disaster response (fire, local flooding etc) delivery services, as well as international relief efforts.

3.2 Aerospace and Defence Industry

The aerospace and defence industry is engaged in the design, manufacture, maintenance and overhaul of aircraft, aviation engines and components. The industry also covers the design, engineering and manufacture of defence systems and components for military use.

Sydney, and in particular Greater Western Sydney(GWS), is already home to a large range of innovative, specialist and high-tech aerospace and defence companies servicing both the domestic and international markets.

The industry operates in both the civil and defence aerospace markets. Aerospace companies in GWS design and manufacture components and systems for major civilian projects such as the Airbus A380 and Boeing 787. The sector also plays a key role in maintaining Australia's strategic defence capability with the Australian Department of Defence a major customer for the region's products and services.

Sydney is also home to a substantial number of Australia's Defence Force (ADF) service men and women across all branches, located at 17 key Defence Force establishments. The region is home base for significant ADF capabilities, including the RAAF Heavy Air Lift Group, Australian Army Special Forces, and Navy Afloat Support, Minehunters and Clearance Diving Teams.

This concentrated presence means the region is home to a large pool of defence-capable companies and organisations, including a number of prime contractors.

Main activities undertaken in the region are design, (MRO) - maintenance repair and overhaul, project management, in-service support and advanced manufacturing. The aerospace and defence industry is technologically advanced, dealing with state-of-the-art systems and operations. The industry in GWS takes advantage of a skilled labour force along with research and development opportunities to provide high-end value add manufacturing solutions.

GWS's capabilities in relation to the design, engineering and manufacture of aviation and defence components includes the:

- Manufacture of electronic aviation and software systems;
- Engineering of tooling systems for the manufacture of aircraft bodies and components;
- Manufacture of aircraft engines and internal and external body components; and
- Design and manufacture of defence systems for guided missiles, sonar and unmanned vehicles.

Capabilities in relation to the repair, maintenance and overhaul of civil and military aircraft in GWS at the Bankstown and Richmond Airports includes:

- Assembly and maintenance of helicopters;
- Repair and maintenance of defence aircraft;
- Maintenance and overhaul of large aircraft and engines; and
- Repair of aircraft components.

Leading Businesses include:-

Australian Aerospace – A subsidiary of Eurocopter, Australian Aerospace is the only manufacturer of helicopters in Australia. The company has a significant maintenance operation at Bankstown Airport.

BAE Systems – Assembly, maintenance and overhaul of aircraft and military systems for the Australian Defence Force. Core capabilities include guided weapons, optical systems, unmanned aerial vehicles and electronic warfare systems.

Forgacs- Broens Industries – With a state-of-the-art factory in Ingleburn, Broens Industries is one of the most advanced aerospace and defence manufacturers in Australia. Broens produces major tooling programs for commercial aircraft and components and assembly automation systems for military applications for a range of major global clients.

Byron Aviation – Design, manufacture and maintenance of equipment for commercial aviation and defence. The Revesby based company specialises in the manufacture of interior modifications, in-flight and ground support equipment.

Hawker Pacific – Design, engineering and overhaul of aviation engines and components with a major operation at Bankstown Airport.

Quickstep Technologies - Largest independent aerospace-grade advanced composite manufacturer in Australia with facility at Bankstown Airport- using both traditional autoclave and leading edge out-of-autoclave production technologies for aerospace and automotive.

Northrop Grumman (ex Qantas Defence Services) – specialize in Cyber, Logistics, Autonomous Systems, C4ISR, and Strike -. UAV's, Cybersecurity at Villawood and Mascot, Maintenance and overhaul of military aircraft, facilities at engines and avionic components at Bankstown and Richmond airports.

Raytheon Australia – A large multinational manufacturer of avionics, electronics and combat systems. Key areas of expertise include weapons systems, submarine combat systems and systems integration.

Thales – Manufacturer of underwater equipment and weapons systems for global defence clients. The Sydney Olympic Park and Rydalmere based company specialises in the development of navigational aid equipment and sonar systems for military vessels.

Thomas Electronics – Manufacturer of electronic systems for defence and aerospace

Turbomeca Australasia – A subsidiary of SAFRAN, a leading global helicopter engine manufacturer with an assembly and maintenance operation at Bankstown Airport.

Major Aerospace Supply- Chain Cluster

As mentioned previously, RDA Sydney is the founder and facilitator of the Sydney Aerospace and Defence Interest Group (SADIG), a collaborative of industry groups which together has attracted over 200 member companies, to pursue further development and opportunities for aerospace and defence industries. (See www.sadig.org.au)

SADIG facilitates companies and key government agencies to come together on a collaborative basis to share information, knowledge, expertise and future applications of technology. Where there are opportunities for advanced technology applications at airports, or clustered activity for aviation manufacture, repairs, maintenance and operations, the SADIG aerospace and aviation stakeholders have capability for significant economic impacts.

RDA Sydney (through SADIG) also works closely with the Department of Defence, NSW DoI , Austrade, DST, DATA 61/CSIRO, 8 different NSW university research groups, the Warren Centre, the Royal Aeronautical Engineers, the Royal Aeronautical Society and the Aviation-Aerospace Australia.

Drawing on industry background experience from SADIG members It is believed that with the vision and support from both the Australian and NSW government, there could be a real opportunity to develop far more significant aerospace, aviation and defence industry technology, design, support, sustainment and manufacturing facilities in the vicinity of the WSEA and a 24/7 airport but as a part of a *virtual collaborative industry cluster*.

This virtual collaborative industry cluster should be developed in conjunction with the other key industry clusters at Mascot, Macquarie Park, Bankstown and Richmond but include all of the key CSIRO, Data 61 and NSW university aerospace research centres as well as working in conjunction with the Hunter Defence and Shoalhaven Defence clusters.

It is agreed that whilst there is interest in this proposal there needs to be a lot more discussion about it. Further investigation and workshops are recommended to develop these ideas,

NSW – Defence Science Institute

The Defence Department current *First Principles Review* and the *National Innovation and Science Agenda* provide the framework for greater consolidation and integration of Defence's technology expertise and national science infrastructure. The Defence Science and Technology (DST) Group, as the broker of Defence R&D activities, has been tasked to execute this plan and establish the necessary partnerships and collaborations with leading scientific establishments within industry and academia as part of Defence's innovation strategy.

The Defence Science Institute (DSI) is one of the mechanisms that the Department of Defence is using to build networks and collaboration between industry and universities. The objective is to build on the DSI model of engagement in Victoria to create "DSI" like entities in NSW and SA. The DST group has been working with SADIG industry team with support of 8 NSW universities, since last year, to promote the idea to the NSW Chief Scientists office and the NSW Department of Industry.

This proposal seeks to establish a similar entity in NSW to create defence science networks and collaborations between NSW industry and universities. Defence will network the DSI's in all states to create greater opportunity for all industry and all universities. This initiative will support the collaborative industry development initiatives outlined above.

Aerospace Space Research Hub Centre

SADIG has three active working committees- *Supply Chain*, *Innovation* and *Skills*, and three specialist sub focus working groups in the areas of *Composites*, *Autonomous Systems*, and *Space 2.0. Systems*. It is through these groups that the following potential strategic industry opportunities have been identified:-

Australia's Space Industry

Australia's ongoing social, environmental and economic well-being depends on the continued and cost effective access to satellite data.

- Position, navigation and timing data is becoming increasingly central to personal navigation and planning, and the ongoing economic productivity and security of industry sectors such as transport, logistics, mining and agriculture.
- Geospatial and Earth observation data help us understand weather predictions, droughts, forest fires, urban development, and future social planning needs.
- Satellite communications technologies, including broadband, enable Australian citizens and companies to conduct essential business and access critical services such as emergency transport.

Australia has had an active civil space program since 1947, but its *Satellite Utilisation Policy*²¹ states that it "does not commit Australia to human spaceflight, domestic launch

capabilities or to the exploration of other planets". The global space industry is estimated to be worth around \$US1 trillion by 2050.

Australia already has a burgeoning space industry, but policy has not kept up with the pace of technological and industry growth, industry leaders say." In a nutshell, the cost of space missions has fallen a thousand fold, we want to seize the disruption that's occurring in the industry by that low cost window that's opened up to leapfrog the old models of doing space," said Tim Parson, chief executive of start-up accelerator *Delta-V*. "We're kind of deciding we're not going to wait for the government, we're going to show leadership and we're going to actually execute missions using start-up thinking."

Entrepreneurs said they are tapping into private investment and partnerships with universities instead of waiting for government support, building new companies and new applications that solve problems on Earth. Some start-up companies, including those at delta-V, are working on projects including miniaturised satellites, data gathering and earth observation using hyper-spectral cameras.

Andrew Dempster, Director of the Australian Centre for Space Engineering Research at the University of New South Wales said Australia is technologically capable of running a space industry. "We're the largest economy in the world not to have a space agency and there's no real excuse for that either," Mr Dempster said. "We're much more positive about where that can go and we have 10 to a dozen different small start-up companies, people looking to actually get stuck into space. On the policy side I think it's not so much we need a change in policy, we need a policy."

Australia's space industry is already on the international map, with the International Space University running its *Southern Hemisphere Summer Space Program* in Adelaide while, next year, Australia will play host to the *International Astronautical Congress*, the world's largest space conference.

Autonomous Systems/ UAV Testing Precinct

The unmanned aerial sector has been steadily growing in the background for over 15 years. Initially seen in the military, UAS are now increasingly used in a civil capacity to carry out various operations, often more cost effectively and with less safety risk to humans than conventionally piloted aircraft (CPA). It is expected that over the next 15 years, the commercial use of unmanned systems will increase over one hundred fold (in the United States, by 2030, it is predicted that over 100,000 UAS will be operating commercially). This global growth trend is expected to be replicated in Australia.

Australia has a large land mass with a mostly urban population (80% population) located mostly on the east coast. The remoteness and the need for surveillance has created significant opportunities in both defence and commercial markets for UAVs and autonomous systems. NSW, being geographically midway along the eastern seaboard will become the major commercial market, with the presence of unique potential industry, research technical capabilities and competitive strengths.

- Sydney and NSW host several of Australia's Australian Defence Force (ADF) - Air, Naval and Land strategic bases. Sydney has four operating airports at Kingsford

- Smith (Domestic and International), Bankstown and Camden (General Aviation), and Richmond (RAAF); with a new Western Sydney Airport to come;
- 64% of NSW's Defence companies are operating from Sydney;
 - Many of the world's leading defence prime contracting firms have technology offices and suppliers in Sydney – particularly in the areas of aerospace, systems integration, intelligence, warfare and sensor systems, with simulation support infrastructure eg Northrop Grumman, Thales, Safran, Raytheon and BAE;
 - NSW has several leading edge SME Unmanned Autonomous Vehicles (UAV), Unmanned Autonomous Systems (UAS) system developers, hardware and software providers selling to both the Australian and international markets;
 - NSW universities have a strong academic and industry technology presence in aerospace - both in design of UAV's, sensory equipment, unmanned systems and field robotics, but also more importantly in design of appropriate systems integration technology/software;
 - Most of the leading digital, virtual reality IT and creative movie industries in Australia are operating from Sydney;
 - Significant materials science, composites, miniature electronic design industry and research capability;
 - Significant simulation, spatial planning, mining and agricultural technology software research and industry capability;
 - Sydney hosts a large international pilot and engineering education training and major aviation sustainment and repair industry.

Autonomous Systems Focus Group

RDA Sydney through SADIG has been instrumental in bringing together an Autonomous Systems Focus Group. The intended aim of this Autonomous Systems Focus Group is to overcome many of the present barriers, and through better collaboration help to develop additional market opportunities for all of the research and industry stakeholders both domestically and overseas. They have scoped interest and capabilities from a range of NSW based research organizations and industries (with their national affiliations) so as to encourage and further develop/grow their expertise and commercial interests.

A key outcome from this focus group has been the identified need to provide appropriate technical industry input to government agencies including CASA, to enable better policy settings, with respect to legislation, and regulatory accreditations and licensing of UAS operators.

Another group outcome has been the identified need to somehow develop a NSW led *virtual collaborative cluster* integrating the various unique industry, university and research hubs within NSW in a similar way to the original *ARC Centre of Excellence for Autonomous Systems* that used to operate with five university research centres up until the end of 2010.

One of the major opportunities that the group see is the development of an UAV /autonomous systems testing centre, which would be ideally located near the new WSA airport, in a similar way to the Australian Research Centre for Aerospace Automation (ARCAA) precinct near Brisbane airport – (See www.acraa.aero).

The group has discussed the development of a US styled NASA space hub centre in Sydney bringing together the various university and CSIRO research and industry group activities. One of NASA's famous astronauts, Greg Chamitoff, who heads up the Texas University space research program, and is also a visiting professor with the USYD School of Aerospace, Mechanical and Mechatronic Engineering, has proposed a Texas NASA style model (See discussion in the next section).

NSW led Australian Space Industry

In the last year, a separate Astronautics and Space 2.0 steering group has been established jointly by the NSW Department of Industry (Dol)), and RDA Sydney; with representatives from Aviation-Aerospace Australia, Australian Centre for Space Engineering Research (ACSER), Department of Industry, UNSW Sydney, UNSW Canberra, Space Industry Association of Australia, Delta-V Spacehub, Saber Astronautics, The University of Sydney and several interested businesses.

The objectives of this group have been to identify the key industry areas of activity, the key players and capabilities, with a focus on further industry engagement, participation and opportunity scoping, and to help develop and communicate a new strategic direction for the NSW based industry to enhance uptake of *A+S2.0 Space* projects - particularly in developing new uses and new technology algorithms, software and process systems which could be implemented using small low-cost cube satellite technology.

Discussion has also centred on the development of a US styled NASA space hub centre in Sydney similar to say the - *AeroSpace Technology Research and Operations (ASTRO) Center* at the University of Texas. See <http://astrocenter.tamu.edu/> . This space hub may ultimately grow to be part of a *national Australian aerospace agency*. This NSW virtual collaborative space hub centre would be an opportunity in bringing together government, the various key universities, and CSIRO research and industry groups already active in NSW with the following draft mission:-

- Foster greater collaboration between industry, government and academia across NSW and Australia in order to strengthen and grow national aerospace and autonomous systems capabilities, and to establish international relationships that will promote and enhance access to overseas markets.
- Guide research and technology direction, and advise academic programs across targeted research and capability streams, in order to assure relevant and high quality aerospace and autonomous education and research outcomes.
- Consistently inspire students and the public with the possibilities of Australian break-through technology and involvement in the future of Aerospace and Autonomous Systems through STEM outreach activities.

3.3 Transport & Logistics

The Greater Western Sydney region has emerged as a pivotal hub in the Australian transport & logistics industry due to its strategic location in Sydney and its access to markets along the eastern seaboard and internationally. It is characterized by large companies with extensive transport and distribution networks and companies providing services covering all facets of supply chain management.

Due to the proximity to the M7, M2, M4 and M5 Sydney orbital motorways, GWS is also home to significant warehousing and distribution centres for some of Australia's largest retailers, wholesalers, construction companies and manufacturers looking to move their products to their customers as efficiently as possible. Many of these areas are either in or adjacent to WSEA – in particular:- Eastern Creek, Ropes Creek and Erskine Park, Minchinbury, Huntingwood, Greystanes, Smithfield, Wetherill Park and Prestons.

The industry in GWS is now well developed with the capability to organise and execute the transport and storage of goods on a national and global level by road, rail, sea and air.

GWS is an important hub in Australia's sea freight network with studies indicating that over 80% of containers imported into Sydney's Port Botany are delivered within 40 kms radius of the Port within the Sydney metropolitan area. The goods associated with those 80% of import containers are either destined for the Sydney market or unpacked at Sydney based distribution centres, repackaged and distributed to regional NSW or interstate.

According to the latest NSW Ports Masterplan 2015²², Port Botany is expected to become Australia's largest container port by volume in the next 30 years. Containers are expected to grow from 2.3 million TEU now to between 7.5 million and 8.4 million TEU per year by 2045. The current rail/road intermodal terminals at Cooks River, Yennora, Chullora, Villawood and Minto, will be added to by new intermodal terminals coming online at Enfield, Moorebank, St Marys, with a planned future terminal at Eastern Creek and another adjacent to the Western Sydney Airport at Badgerys Creek. NSW Ports expect the current trends to continue but with an upward trend of containers destined for Sydney's western and south western suburbs, especially to Blacktown, Fairfield, Holroyd (now Cumberland) and Liverpool due to the availability of large parcels of land and lower costs.

Road transport represents the major mode of transport in GWS due largely to the extensive infrastructure network within the region providing access to intrastate and interstate markets. Major services include: - long-haul road transport, local distribution and express courier services. With recent technological changes introduced via the internet and digital disruption, there is now a market expectation by customers for real-time online sales transactions, requiring next-day supply chain processes and deliveries. Already, we are seeing major changes in courier delivery processes and last mile deliveries in and around the Sydney metropolitan area.

To reduce congestion there is already a major push by the NSW government, and industry as a whole, to increase the proportion of containers carried from Port Botany by rail from about 12-14% to 40% over the next 15-20 years. As noted in the NSW Ports Strategic Plan a new dedicated Western Sydney freight rail line has been planned for some time running via an extension line west from Yennora to the planned new intermodal terminal at Ropes Creek near Eastern Creek. There also has been discussion in the development of the *Broader WSEA Structure Plan*

Transport Plans prepared by GHD, and in the TfNSW *NSW Long Term Transport Masterplan*²³ to have a dedicated freight line within the proposed M9 transport corridor running north-south around to a new intermodal terminal near the new Western Sydney airport- possibly via Leppington or from further south near Camden.

The air freight sector up until recently, has been a much smaller component of the transport industry in GWS. The sector includes air freight operations located by Toll and DHL at Bankstown Airport and companies with warehouse and logistics facilities integrated with air freight operations at Sydney's KSA Airport at Mascot. However with the necessitated growth in next day real-time express deliveries there has been a major growth in international courier and forwarding companies, and third party fulfilment companies setting up in GWS.

Potential new export business opportunities with a 24/7 airport & supply chain market changes caused by digital disruption in the future

By air, Sydney is approximately 10 hours flying time from Shanghai whereas London is 12 hours and Los Angeles is 14 hours. This could be a game changer for Australian international trade in imports and exports out of the rapidly growing Asian Pacific markets - with opportunities flowing for new business as a result of speedier transactions and the delivery of goods over the internet, supported by an effective and efficient air freight and forwarding service. For example, the Export Council of Australia (ECA) reports that in China access to the internet is presently at about 15-18% but in 10 years it will be about 60-70%²⁴. The expectation is that individuals will seek higher value quality goods and services on-line!

With a new 24/7 airport, this represents a huge opportunity for Australian exporters but also a big threat to the status quo with respect to imports! With an additional influx of new airlines from North Asia and South Asia in particular, it is expected that there would be a significant increase in the use air freight and commercial business travel, as a result. The recent buy-into Virgin Australia Airlines by China-based airlines and Japan Post into Toll highlights the interest.

It is anticipated that as a result of the changes outlined above, that there will be a significant increase in the need for innovative world class supply-chain management and other logistics services :-

- Real-time machine to machine and B2B financial and communication processes and systems;
- Big Data Inventory and supply chain software solutions;
- Financial management, and e-Logistics systems;
- Sophisticated new streamlined customs and quarantine processes;
- *Very effective and efficient last-mile distribution* both within the new airport, but also to and from adjacent distribution centres and/or intermodal terminals; and /or fulfilment centres or manufacturers in WSEA or in GWS overall;
- Highly efficient and flexible supply-chain warehousing processes and distribution systems.

In line with these changes it is proposed there lies new opportunities in developing the following:-

- **New intermodal terminal – Eastern Creek**

New Intermodal Road/Rail Terminal at Ropes Creek near Eastern Creek with interconnecting freight rail links from existing freight line at Yennora, and Port Botany, and also a new rail link to the existing Western line. Effective and efficient road freight access roads will need to be considered within the planned future growth of WSEA - particularly for product distribution with the rest of Sydney to avoid any additional congestion and also to maximise the interconnectivity to the new airport.

- **New intermodal terminal – Badgerys Creek**

Whilst this would not occur for some time into the future, it is imperative that a future major road/rail and air intermodal terminal be planned for Badgerys Creek on the western side of the new airport site. The terminal would need to incorporate rail freight and road access via the planned M9 transport corridor. To maximise the efficiency of air cargo services to and from and around the airport, it is strongly recommended that grade separation be considered on and around the potential Northern Road intersections in and out of the airport with special freight only roads

- **T&L industry Centre of Excellence precinct**

A new *collaborative T&L industry Centre of Excellence* precinct at Eastern Creek, which would include a *T&L Supply chain management education and research centre*. This centre of excellence precinct would provide a virtual hub of activities for both industry groups and supportive SME technology companies for all of the T&L precincts in GWS. It could also be linked back to the significant individual research and university transport & logistics knowledge centres already based in Sydney, Newcastle and Wollongong.

The following research institutions would be able to provide some expertise:

- CSIRO/ Data 61- Future Logistics Living Laboratory (FLLL)
- USYD Australian Centre for Field Robotics (ACFR)
- USYD Institute of Transport and Logistics Studies (ITLIS)
- UNSW Traffic and Road Safety
- UTS Transport Research Centre
- UoW SMART Infrastructure Facility
- UNSW Robotics and Autonomous Group
- UTS Centre for Autonomous Systems (CAS)
- UoN Faculty of Engineering and Built Environment
- TAFE NSW WSI and TAFE SWSI
- WSU Intelligent Systems Laboratory

- **Transport for NSW (TfNSW) Smart Innovation Centre for Partnership and Collaboration**

Recently TfNSW have sought EOI's from industry and research groups for a smart innovation centre to focus on autonomous vehicles and transport systems base in Huntingwood, Blacktown near WSEA. As we understand it the Centre will act as a technology hub and provide a focus for a wide range of external partners, as well as incorporating technology programs across Transport for NSW (TfNSW).

Similar to that proposed on the previous page, the TfNSW smart innovation centre will also be an incubator for commercial and academic partners wanting to maximise the potential for their technology innovations. As there is already significant individual campus activity, they see the opportunity of having a virtual network of multi-campus participants, but with specific areas such as the site at Huntingwood where new technologies can be developed and tested. RDA Sydney has offered to assist in helping the development of such a hub by assisting in making the necessary connections through their current contact and activities.

- **Supply Chain e-Commerce.**

Progressively these new *In-bound & out-bound high value air freight forwarding warehousing and retail distribution fulfilment opportunities* are going to need the local presence all of the international e-commerce online banking and B2B communications companies along with all of the freight forwarding, customs brokers and shipping, warehousing specialists. This is going to generate a need for more commercial buildings with appropriate retail and office support amenities to attract and keep staff.

- **National Distribution Centres**

In view of the expected population growth in Western Sydney, and also the growth in transport and logistics container volumes within Sydney, it is expected that there will be significant additional growth in the need for warehouse, manufacturing, distribution and transport sales offices at Blacktown, Eastern Creek, Prestons, and Liverpool, and in the future around Leppington and Bringelly. Global forwarding, customs warehousing groups will need to be interconnected to road/rail/air intermodals at St Marys, Eastern Creek, Moorebank, Enfield, Villawood, Chullora and MIST at Minto.

- **Supply Chain, Warehouse Engineering Support & Transport Equipment**

With the rapid growth in these large scale supply chain logistics and warehouse activities in the WSEA and GWS areas, there already has been a rapid growth in both supply chain warehousing engineering support and transport equipment specialists. For example there are said to be over 100 support SME companies technically needed to both design, operate and support the operations of a large retail distribution centre such as Woolworth's at Minchinbury. It is envisaged that there will continue to be growth in these smaller technical SME's who can provide these skills and expertise.

3.4 Digital Industries

Data Capture & Storage

There is an opportunity to build onto the rapidly growing Data Capture & Storage sector at Eastern Creek with lower land costs and availability of major high-load electricity connections. With almost \$500 million invested in data centre construction in Sydney's West, this could form the building blocks for a suburban technology industry that provides jobs to the local area's technology trainees.

Since 2013, the area has already hosted the launches of the \$200 million "Aurora" HP data centre in Eastern Creek, Blacktown, and the \$250 million Digital Realty data centre in nearby Erskine Park, Penrith, where US company Rackspace's Australian subsidiary is based. Woolworths already has a data centre in Erskine Park.

The *IT Industry Action Plan* produced by the NSW Digital Economy Industry Taskforce in 2013²⁵ identified the demand among banks, financial institutions, and other professional service organisations, for reliable and secure data centres and co-location centres. The taskforce commented at the time "In addition to the direct investment and jobs created by a new data centre, availability of these facilities is often a determining factor in attracting investment by major companies to NSW, and is essential in supporting the business requirements of NSW industry,"

ICT Technology, Warehousing Engineering Support Companies

The growth in the presence of the major retailers, wholesaler and distribution companies has necessitated the growth of ICT technology, warehousing engineering support companies. With digital disruption the need for real-time B2B and machine to machine communications, high speed transactions and fulfilment processes will be critical. It is expected that there will be a rapid growth in new businesses in this sector. For example Ingram Micro have just opened their new warehouse facility at Eastern Creek.

In addition, the presence of the large international IT transport and consumer goods importer distributors such as LG, Sanyo, Sony, is creating demand for local Australian contract electronic design and manufacturing specialists such as Inventis Technology Gregory who have just moved in nearby.

Potential new business opportunities with a 24/7 airport & supply chain market changes caused by digital disruption in the future

According to the NSW Department of Industry website, NSW is Australia's premier market for digital creative and information communication technology (ICT) industries with the largest ICT sector and highest number of technology start-ups in Australia. With vast innovative talent driving new technologies, advanced research and innovation institutions and a favourable regulatory and business environment the NSW ICT sector offers great opportunities for investing, moving or starting a new business.

NSW is Australia's ICT capital with significant competitive advantages:

- We operate in a time zone that bridges markets closing in the US and opening in the UK and Europe.
- We are ideally situated to service fast growing Asian markets.
- We have leading telecommunications infrastructure, including nine landings of international high-capacity fibre optic cables that link the state to Asia, Europe and the United States.
- We lead all other Australian states and territories with ICT research capabilities and have 11 universities producing more ICT graduates than any other state.
- We have a large pool of skilled labour with more people working in ICT-related fields than any other state.
- We provide direct access to venture capital and Australia's largest financial services industry.
- We produce around 50 per cent of Australia's ICT exports – valued at close to A\$1.3 billion annually.
- Our ICT-based research institutes offer access to top talent and unique collaboration opportunities, including Australia's largest data innovation group, Data61.
- Sydney is the national headquarters for more multinational companies than any other Australian city, including ICT firms such as Amazon Web Services, Google, Microsoft, Dropbox, LinkedIn, Twitter and cloud computing provider Rackspace.

In May 2016, the NSW government published Sydney and NSW, Australia's ICT and Digital Capital²⁶ which outlines the state's ICT and digital strengths.

Is there a missed opportunity for a Western Sydney Digital Creative Knowledge Hub?

Much of the NSW ICT Industry Action Plan has centered attention on the need to develop knowledge clusters. However within Sydney to date, nearly all of the NSW government effort has been focused in helping develop an initial digital creative hub called *Piivot* in the Sydney CBD.

Piivot, set up by UTS and the ICT industry, is a collaborative partnership that brings the digital and tech start-up community together with businesses, research organisations and government. The aim is to enable businesses within the sector to share knowledge, support innovation and gain an advantage in an increasingly competitive global market. As an outcome, which RDA Sydney supports, Piivot will increase innovative start-up activity in the creative digital and technology sector, and improve commercialisation of these ventures by ensuring a stable development environment and better financing and investment.

The important question is how is it possible to build additional virtual digital creative knowledge hubs which can work collaboratively across the broader metropolitan area of Sydney around a broad overall industry creative digital industry network.

It is well known that there are several digital and creative industry clusters operating around Sydney which are not in the CBD – e.g. advertising industry (Crow's Nest /North Sydney); NIDA creative drama production near UNSW; digital and creative industry companies (Macquarie Park, SOPA and Rhodes); creative *Wiggles* digital production (Blacktown/Norwest), Parramatta Arts Centres, the Penrith, Campbelltown, Cabramatta and Liverpool arts centres, and the Blue Mountains BMEE *MTNS Made* creative industries cluster.

RDA Sydney believes that the solution would be the adoption of a recommendation it has made to the NSW government for many years- the idea of a *Global Connect Sydney* cluster (including a creative industries cluster) similar to the famous *Connect UCSD* San Diego which has been operating in the San Diego region since 1990.

See www. <http://globalconnect.ucsd.edu/network.cfm>

In their report *Connect UCSD Innovation in Motion Annual Report for 2010*²⁷ - (pages 4,5,6) they report on the 25 years of success in creating and supporting startups and clustering across the San Diego region. On these pages the report illustrates show just how geographically spread out the companies are across the region and across the industry specialty streams! The figure below shows the spread of companies overall.

In the Appendix 5.3 Best Practice - *Connect San Diego* of this RDA Sydney report we have included a summary of the features and activities of this famous cluster model.

5,000 Nearsourcing Companies²⁸



3.5 Advanced Manufacturing & Electronics

Greater Western Sydney (GWS) is one of the largest and most diverse manufacturing regions in Australia. Manufacturing is the largest industry in GWS valued at \$12.7billion in 2013-2014 out of \$33 billion NSW state total. For the GWS region it represents 12.2% of the region's economy of \$104 billion, and is still the largest employer with about 95,100 employees, about 13.9% of the workforce. (See RDA Sydney's 2015 Economic Baseline Assessment Report²⁹).

Manufacturing products from GWS still plays an important role in the Asia Pacific region and is home to major multi-national corporations and manufacturers exporting elaborately transformed manufactures globally. However the manufacturing sector across Australia, has been undergoing significant change in the last two decades. With the prevailing period of a relatively high Australian dollar, traditional manufacturing operations have continued to experience significant pressure from other countries where the cost of labour and operation is considerably lower. This has seen 'lower value adding' manufacturers (characterised by less technologically advanced operations that manufacture relatively lower valued products) keep the design and pre-engineering function, and move overseas to take advantage of lower costs. This includes manufacturers in areas such as motor vehicles, appliances, clothing and furniture.

As the 'lower value adding' manufacturers move offshore, the Australian manufacturing sector has been transforming with growth in the advanced high value sector. The expanding sector is characterised by significant investment in innovation, research and development as well as the use of technology and the production of goods that have a relatively high value. The R&D component includes opportunities to work closely with research groups and universities in Sydney.

Key clusters of advanced manufacturing sectors in Metropolitan Sydney include:

- **Aviation/Aerospace/Defence:** CBD, Mascot, Macquarie Park, Bankstown, Richmond, Villawood, Ingleburn, Warriewood and Camden;
- **Pharmaceuticals and Biotechnology:** CBD, Macquarie Park, Norwest, Parramatta, Rydalmere, Dee Why, Frenchs Forest, Pymble, Westmead, Minto and Granville;
- **Electronics:** CBD, Penrith, Blacktown, Liverpool, Norwest, Sydney Olympic Park, Silverwater, Rhodes and Macquarie Park;
- **Machinery & Engineered Products:** Kirrawee, Botany, Brookvale, Artarmon, Kingsgrove, Wetherill Park, Blacktown, Condell Park/Milperra, Liverpool, Ingleburn, Villawood, Minto, Camden, St Mary's, Mt Ku-ring-gai and Warriewood;
- **Automotive:** Bankstown, Blacktown, Caringbah, and Campbelltown;
- **Building and Construction Materials:** Prospect, Wetherill Park, Rosehill, Picton, Erskine Park, Liverpool and Emu Plains;
- **Plastics & Chemicals:** Botany, Banksmeadow, Kurnell, Padstow, Rose Hill, Blacktown, Milperra, Wetherill Park, Kingsgrove, Penrith and Ingleburn; and
- **Food & Agribusiness:** Huntingwood, Blacktown, Silverwater, Wetherill Park, Botany, Caringbah, Kingsgrove, Liverpool, Ingleburn and Bankstown.

The implications for the Sydney manufacturing sector are that in order to remain competitive at the international level, it has to take advantage of the skilled workforce and opportunities for innovation as well as research and development, primarily focusing on customised, short-run, high value innovative products and services, export oriented which can tap into global supply chain opportunities. A depreciating Australian dollar will provide significant support for Sydney operators as they invest in productivity, new innovative products and services, and research and development in order to enhance and solidify Sydney's manufacturing sector.

Potential new export business opportunities with a 24/7 airport & supply chain market changes caused by digital disruption in the future.

The expanding sector is characterised by significant investment in innovation, research and development. Leading edge companies are winning major business deals in world markets and are manufacturing innovative new products and solutions for delivery into the global supply chain.

According to a recent article by Cerasis³⁰, *"manufacturing technology is not what it used to be a decade ago. Today's increasingly automated and software driven industries have reduced human intervention to pressing only a few buttons in some cases. The application of advanced technologies in manufacturing such as nanotechnology, cloud computing, the [Internet of Things](#) (IoT) are changing the face of manufacturing in ways unimaginable a few decades ago. In addition to cutting the costs, these technologies create speed, precision, efficiency and flexibility for manufacturing companies"*

Some of the advanced technologies that are driving growth;-

3D Printing (Additive Manufacturing)

One of the biggest news in the manufacturing technology sector in the last few years is the proliferation and [application of 3D printing technology](#). It has caught the imagination of the general public and the manufacturing community like nothing since the invention of the personal computer and the internet. Within a few years, the technology has evolved so much that it is now possible to produce almost any component using metal, plastic, mixed materials and even human tissue. It has forced engineers and designers to think very differently when thinking about product development. As more manufacturers [adopt and use 3D printing technology](#), there is little doubt that 3D Printing will change the face of manufacturing forever.

3D printing has major applications for the creation of service parts much closer to the end user than historically available. In 2016, the use of 3D printing for manufacturing will grow to focus on the customer-driven designing and co-creating of individual items. This aspect of manufacturing in 2016 will dramatically change how customers view custom product. Imagine ordering something for your size, only in your size, without the need to visit a tailor or make alterations. Now, imagine these applications on a broader scale in all forms of manufacturing, such as printing electronics on-site, during the construction of an airplane. This trend will really change the industry.

Nanotechnology

Nanotechnology is the technology of the future, but the first generation of the technology is already here. It involves the manipulation of matter on atomic, molecular and supramolecular scales; thus bringing with it super-precision manufacturing. Currently applied mostly in space technology and biotechnology, it is going to play an indispensable role in every manufacturing industry in the future. In many ways, it has already changed the world.

Examples of application in nanotechnology include:-

- Faster computer processing,
- Smaller memory cards that have more memory space,
- Clothes that last longer and keep the wearer cool in the summer,
- Bandages that heal wounds faster,
- And tennis and bowling balls that last longer.
- In the future, there will be nanobots (microscopic robots) that will carry drugs to specific tissues in our body.

Material Science and Composites

Materials Science and Engineering is focussed on the development of new and better materials for the next generation of engineering applications. It views the fundamentals of biomaterials, nanomaterials, ceramics, metals, polymers, electronic materials and composites, emphasising the relationships between atomic structure and microstructure as well as the properties, processing and performance of the material

The Internet of Things (IoT)

The Internet of Things (IoT) is a revolutionary manufacturing technology that allows electronic devices connected to each other, within the existing Internet infrastructure, to communicate with one another without human intervention. An IoT device connects to the internet and is capable of generating and receiving signals. As such, the use of this technology is going to have a profound impact on the manufacturing industry.

IoT enables connected devices to "talk" to each other, sending and receiving critical notifications. An example of a critical notification is a defect or damaged ping. Once the device detects a failure, the IoT connected device sends a notification to another device or a user. This type of small, but critical, application of IoT in manufacturing results in reduced downtime, increased quality, reduced waste and less overall costs.

Cloud Computing

Cloud computing is the practice of using a network of Internet-connected remote services along various points to store, manage, and process data. Many companies are already using cloud computing, although the manufacturing industry is still taking time to warm up to the technology due to connectivity and security concerns. Over time, to the present day, cloud computing grows more stable and reliable.

Manufacturers are increasingly implementing cloud computing software in manufacturing plants spread out in various geographic areas in order to share data quickly and efficiently. In implementing cloud computing, manufacturers reduce costs, gain greater quality

control, and increase the speed of production. In the future, it is feasible that all manufacturing facilities will have a connection to the cloud.

Big Data and Predictive Maintenance Technology

Manufacturing industries can significantly increase their efficiency and productivity with the technologies that allow them to collect, process and measure big data in real time. These technologies include electronic devices that connect factories through the internet and web pages that double as dashboards for controlling the processes.

Predictive maintenance technology helps predict snags and defects and thus cuts downtime and costs. In the future, manufacturers will implement big data and predictive maintenance technologies in every area of manufacturing. IoT is a part of big data and predictive technology that manufacturers are already using with remarkable success. Yet, predictive analytics also has applications for increasing customer service and improving experiences across the manufacturing scope. A strong focus on predictive analytics is the fundamental factor in looking towards all new technologies and how they can be used to increase production, drive scalability, and guarantee satisfaction with the quality and quantity of products.

Advanced technologies have been the driving force behind the growth of the manufacturing industries, and they will have a greater role to play in the industries of the future. As new technologies emerge, manufacturers will adopt them, or they will be forced to choose them to survive. On their part, the technologies will change the industries beyond recognition. For example, 3D printing is already changing the way many manufacturers design and manufacture their products.

(See <http://cerasis.com/2016/01/11/manufacturing-technology-trends>)

Embracing Virtual-Reality

In manufacturing, virtual-reality is often referred to as digital design, simulation, and integration. Video games and virtual reality have many different implications for uses across engineering and increasing manufacturing efficiency. For example, a company may have a given design and create this design in a digital space. Essentially, the use of virtual reality eliminates extra work, which improves overall efficiency by streamlining the process, allowing the customer to see what something will look like with a definitive cost and size almost instantaneously.

What does this mean for the future of advanced manufacturing companies?

With the rapid changes and trends outlined above that are occurring worldwide, and the forecasted changes that will occur with digital disruption, future Original Equipment Manufacturers (OEM) will need to offer perceived high-value products and services within market niches operating in sophisticated and very competitive global supply chains.

For both large scale and SME sized companies, this will mean involving the end-use customer far more in offering tailored and customised-designed products and solutions in real time with prompt delivery and with a complementary *buying* and *whole-of-life support* experience.

To achieve this global companies will need more current localised market knowledge, rapid design *time-to-market* engineering and manufacturing prototyping. As a consequence, there currently are, and will be, more opportunities for SME Australian companies to participate and collaborate within international partner-driven supply chains, in the global design, research, engineering development of critical components, and/or in the full (or part) contract manufacturing, final assembly, service delivery and maintenance support.

Where they can be situated near to a 24/7 operating airport there will be additional opportunities and benefits for SME manufacturing to tackle targeted global supply chain markets with high-tech, high-value, cargo time-sensitive products.

As stated earlier in the report, Sydney is only 10 hours flying time from Shanghai and the North Asia market, within the same time-zone relative to 12 hours from London and 14 hours Los Angeles. By comparison to Europe and the US we have a major opportunity to facilitate new additional advanced and electronic manufacturing and trading opportunities with our East Asia and North Asian Pacific neighbours.

To realise these opportunities however, it will be critical that the relative cost of doing business, the real time domestic and international cargo transport efficiencies and distribution costs, the speed of B2B communications, and the real-time financial trading management and efficiencies are achieved relative to our international competition.

For example we currently have manufacturing expertise and capabilities in the following areas which warrant further investigation:-

- Aviation/ Aerospace/Defence
 - High tech OEM and air, land and marine spare parts and equipment
 - 3D and additive manufactured OEM and replacement components
 - Composites and specialist materials
 - Specialised sonar, radar and satellite communications equipment
 - UAS Autonomous systems and equipment
 - Weapons systems
- High tech specialised metal alloy and composites products
 - Graphene and carbon fibre
 - Nano material manufactured products
- Semiconductors and micro-electronics,
 - Silicon chips
 - LED, PV and power electronics
 - Contract electronics manufacturing (CEM)
 - Micro-smart chips for interactive smart products
- Contract design & rapid prototyping
- Specialised robotics systems and equipment
- Precision machining, precision casting & die-mould manufacture
- Cutting tool and machine tool manufacture
- Specialised medical and surgical equipment
- Smart printing circuits and smart clothing
- Specialist food and pharmaceutical packaging equipment
- Specialist OEM and aftermarket automotive parts
- Autonomous field robotic systems and equipment
- Other specialised high value R&D & fabricated products

This expanding sector above is characterised by the need for significant investment in innovation, research and development as well as the use of technology and the production of goods that have a relatively high value. The R&D component includes opportunities to work closely with research groups and universities in Sydney.

Critical supportive R&D manufacturing research capabilities groups in Sydney

Unlike the region of San Diego in the US, or the successful smaller overseas manufacturing countries like Sweden, Denmark and Finland, (or Taiwan, Thailand, Singapore and Korea), overall industry awareness as to the industry capabilities is not well known for the Sydney region.

On the other hand, one of the major advantages for manufacturers in Sydney, that is presently underutilised, is the significant presence, in many cases, of world class leading-edge R&D manufacturing research capabilities within the following research groups:-

CSIRO – With centres at Lindfield and Macquarie Park, CSIRO have science and engineering skills, equipment and international connections to help Australian manufacturers be globally competitive - specialising in biomedical manufacturing, chemicals and fibres, high performance metals, industrial innovation with innovative products and processes.

Data 61 - Leaders in data-centric R&D, Data61, know data in a way few others do. They work with clients across data collection design, data capture and data consumption; statistics, modelling and analytics; cybersecurity; robotics; sensing platforms; communications and networking; software engineering and user experience design; decision sciences; and behavioural economics and cognitive sciences. They are also able to provide expertise in engineering, technology development, user experience, project management and commercialising data-centric solutions.

Australian Nanotechnology Network (ANN) – ANN (formerly ARCINN) is dedicated to substantially enhancing Australia's research outcomes in this important field by promoting effective collaborations, exposing researchers to alternative and complementary approaches from other fields, encouraging forums for postgraduate students and early career researchers, increasing nanotechnology infrastructure, enhancing awareness of existing infrastructure, and promoting international links. The ANN will achieve these goals through its dedication to bringing together all the various groups working in the field of Nanotechnology and related areas within Australia.

Advanced Composite Structures Australia (ACS Australia) - world leader in composites technology development and implementation, partnering with customers to enable innovative design, low-cost manufacture and support of application-critical composite structures. Expertise in engineering design, modelling, analysis, manufacturing process and implementation projects, materials development, structural health monitoring and repair, as well as research project management.

The Centre for Advanced Materials Technology (CAMT) at USYD has a high international profile for its quality research over a wide field in materials characterisation and processing, information technology, nanotechnology, advanced manufacturing, solid mechanics and biotechnology. In the last decade, the CAMT has initiated many new research activities in these areas such as nanomechanics, nanotribology, nano/bio-materials and ultraprecision/nano-machining, smart

materials and structures, eco-materials, superhard films and coatings, polymer blends and alloys, and functionally graded materials.

UNSW - ARC Training Centre for Automated Manufacture of Advanced Composites - A new training Centre for *Automated Manufacture of Advanced Composites* has been established with the aim of developing a new generation of innovative researchers who can transform Australia's high-performance carbon composites manufacturing industry. The training centre will use advanced automation technology to position Australian manufacturers as world-class agile producers of high-value advanced composite structures. Partners include the ANU, Technical University of Munich, the Ford Motor Company, Advanced Composite Structures Australia, the Australian Nuclear Science and Technology Organisation, and the Defence Science and Technology Organisation.

Sustainable Materials Research and Technology Centre (SMaRT) at UNSW, is working on green manufacturing in collaboration with industry, using waste and end-of-life products as raw materials.

The Centre for Autonomous Systems (CAS) at UTS is an internationally acclaimed robotics research group. They specialize in robotics research that creates positive change for government, industry and the wider community. CAS has a history of delivering high impact industry outcomes, particularly through their work on autonomous grit-blasting robots, bio-inspired autonomous climbing robots and smart hoists

Launch Pad at WSU Western Sydney University, is a one-stop shop business and innovation support program that provides facilities, assistance and resources for start-up and high-growth technology based businesses in Western Sydney. Launch Pad supports business by providing modern but low-cost serviced office and co-working space, specialist business advice, mentoring, events, networking, training and education. Clients work within a highly collaborative environment with other technology-focused entrepreneurs, leading to problem solving, sharing of expertise and experience. WSU also has an array of specialist research facilities and a wide range of high end scientific equipment to support research and business communities. This equipment is available to both internal and external academics, students and industry.

The Department of Engineering at Macquarie University is committed to excellence in research, with particular focus on electronics, communication systems, mechatronics and mechanical engineering. Their research is internationally recognized in a number of areas including antenna design, next generation wireless communication systems, and microelectronics. Recent growth has been into the areas of biomedical, mechatronics, and nano-materials engineering.

Advanced Manufacturing Technologies at University of Wollongong (UoW). The Engineering Manufacturing Strength at UOW carries out research to improve manufactured products and manufacturing processes in a never-ending quest for greater accuracy, greater economy and higher quality:-

- Research in computational and experimental mechanics, metal forming biomechanics, structures, thermo-fluids and engineering systems
- Researching new manufacturing methods for the next generation of aircrafts
- Assisting industry with its materials handling problems
- The development of fine machines and controls to assist surgeons in operations
- The improvement of more accurate and 'intelligent' robots

- Developing methods to maintaining the quality of electricity supply for manufacturing processes.

The Centre for Intelligent Mechatronics Research (CIMR) at UoW conducts innovative, multidisciplinary and applied studies on how human perception, behaviour and skills can be emulated and augmented by robotics and machine learning. The concepts and methodologies developed by the group are applied to broad disciplines of biomedical engineering, telerobotics, smart/electric vehicles and computer vision.

New Age of Digital and Smart Product Start-ups

In an article written by Intuit in 2013 - *Infographic – “Sydney and Melbourne among the hottest hubs in the world to ‘start-up’*,”³¹ they reported that although the world looks to Silicon Valley as a beacon for tech start-ups, there are a number of cities all over the world pegged as rising start-up hubs. In the Start-up Ecosystem Report 2012³² Sydney was ranked 12th out of the top 20 cities with respect to its Start-up Eco System, with Melbourne ranked 18th.

Also in the 2013, in the PwC report ‘*The Start-up Economy*’³³, they reported that over 64% of all 1500 tech start-ups in Australia occurred in NSW. They predicted that the Australian start-up sector has the capacity to deliver \$109 billion to the economy, and that whilst most start-ups had occurred within the Information, Media and Telecommunications industry, there were significant opportunities for growth in the Finance and Insurance, Manufacturing and Health Care and Social Assistance industries.

The *Infographic* article also highlighted an interesting correlation between cities with strong art and music cultures and entrepreneurialism - perhaps indicating that elements of creativity, imagination and artistic talent make up a part of what it takes to develop a start-up?

With the presence in Sydney of many of the world’s leading technology and creative companies within the field of Information, Media and Telecommunications, it is believed that this creative and innovative entrepreneurial spirit has the potential to spill over into the new-age design and manufacturing industries.

The PwC report however, identified that these changes would not just automatically occur, and that there is a need for government and regulatory support to aid the growth of these sectors.

Creating a Start-up Eco-System for Manufacturing across Sydney, which includes Greater Western Sydney, built around a UCSD Connect San Diego model will therefore be a critical part of that stimulation. (See Appendix 6.3 Best Practice – Connect San Diego)

Vital Role for Leading Edge Technologies & Additive Manufacturing

In order to bring about change it will be imperative that entrepreneurs, designers, engineers and manufacturers become more aware of the skills and technology capabilities available from other entities across Sydney. The NSW government should encourage and support industry groups to develop clusters and online capability directories across industry specialties and geographically.

Individual companies should be encouraged to learn how to better relate to their clients, understand the changing nature of world markets with digital disruption, and how in response,

they can collaborate strategically with others, and innovate all elements across their business in their products, processes and management systems.

Some of the new leading technologies available in Sydney might include for example:-

New small-volume high-value CNC precision tooling and machining – with companies such as CVW Engineering (Wetherill Park); Forgacs Broens (Ingleburn); Nepean Engineering (Camden); and Bennett Precision Tooling (Kings Park);

Rapid Prototyping / Additive Manufacturing - with companies such as Breseight and Advanced Manufacturing Services (Ingleburn); TR Savage (Fairfield);

3D printing, scanning and modelling – with companies such as 3DMek (Baulkham Hills); RapidPrototype (St Peters); and Blueprint 4D (Alexandria);

Laser Sintering – with companies like Breseight (Ingleburn) and TRSavage (Wetherill Park), who offer both Selective Laser Sintering (SLS) and Direct Laser Sintering (DSL);

New Nano materials and Carbon Fibre Composites – with nanomaterial companies such as Nanovations (Frenchs Forest) and CeramiSphere (Lucas Heights); and carbon composite manufacturers such as Quickstep Technology (Bankstown) and CST Composites (Caringbah);

Specialist Alloys & Precision Investment Castings– with companies such as Hycast Metals (Smithfield) who make precision castings; Quality Castings (Revesby); and Austral Alloys (Bankstown) who make a range of specialty ferrous alloys;

Autonomous systems and robotics – with companies such as Scott Automation & Robotics and Applied Robotics (Silverwater); Apex Automation & Robotics (Seven Hills); Marathon Targets (Marrickville); NDC Automation (French's Forest); Ocular Robotics (Kingsgrove); and Strategic Engineering (Kirrawee).

Contract Electronics Manufacturers (CEMs) vital to future of Australian electronics

Despite major changes over the last 15-20 years Sydney still has several world-class leading-edge electronics and micro electronics companies. In semiconductors, for example we have CAP-XX at Lane Cove, Silanna at Sydney Olympic Park and BluGlass at Silverwater.

- CAP-XX makes thin, flat supercapacitors with best-in-class power and energy density – ideal for space-constrained, handheld and wearable electronics. CAP-XX complements or replaces batteries, supports energy harvesters and provides a boost to current-limited power supplies
- Silanna develops semiconductor processes that reduce the on-resistance and the capacitance of transistors. Those processes are “ported” into world class foundries and then combined with Silanna’s state-of-the-art designs. The end result are high performance world class commercial semiconductor devices for *Isolation* and *Power* applications.

- BluGlass is a green Australian clean-tech public company established to commercialise exciting semiconductor technology. BluGlass evolved from more than 15 years research at Sydney's Macquarie University, and is developing a process and equipment using Remote Plasma Chemical Vapour Deposition (RPCVD) to grow semiconductor materials for the production of high efficiency devices such as light emitting diodes (LEDs), power electronics and solar cells.

According an extract from April 2011 *Electronics News*³⁴, at the time, “*high-volume manufacturing jobs had largely moved offshore, as the effect of globalisation forced companies to seek lower labour costs in regions like China and SE Asia. The local electronics industry has since attempted to fill the void left by the absence of the assembly operation by attempting to become a fully-fledged member of the information economy, specialising in IP, design, research & development.*

GPC Electronics for example is a major player in the contract electronics manufacturing industry, with factories in Penrith (Sydney), Christchurch (New Zealand) and China. Its customers include Siemens, Nortel, NEC, Alcatel and Ingenico. On-Track Technology, on the other hand is based in Mascot, and provides quality products with quick turnaround, competitive costs and on-time delivery. Its facility is 100 percent ESD safe and climate controlled

Companies turn to contract electronics manufacturers (CEMs) like these when the winning design they've come up with on paper has to be turned into a tangible product. CEMs typically provide a “one-stop shop” for the entire range of services, such as PCB manufacturing and checking, component sourcing, component storage, CNC and metal work, board population, in-circuit- and functional-testing, prototyping, pilot runs, product runs, final assembly, packaging and delivery. According to GPC Electronics' managing director Christopher Janssen, his company can even provide direct shipping and fulfilment services to customers.

*The flexibility that CEMs offer is a major appeal for OEMs. It lowers the risk in the early days of a product's development when it's difficult to know how volumes will ramp up – or even if a product is going to take off at all. “We have customers like young companies and startups who run initial production but do not have visibility or certainty of the orders. They usually look for scalability,” GPC's Janssen told *Electronics News* in 2011. “We can transition the product to another location like China and manufacture there if they are going to a global marketplace with higher volume product with cost sensitivities.”*

GPC Electronics' clients have other reasons for using a CEM. Janssen says some prefer to run products locally so they can be involved in the production process itself, sometimes because the product isn't stable. The company also manufactures complex products for large multinationals, providing box builds of products in the medical, automotive, industrial, and communications sectors.

In an increasingly competitive market, simply providing manufacturing is often not enough. Like the Australian design industry, CEMs have found “value-adding” is key to retaining business. For local companies eliminating the tyranny of distance is a major consideration for its clients.- “If something goes wrong with a product in an overseas factory, it gets delayed for a lot longer because [clients] can't fly over there quickly to inspect their factory and to look at their products while it's on the line,” “if there's an engineering change, they can't just go to their offshore

manufacturer and stop production.” Pang from Ontrack Technology “Local manufacturing allows these modifications.”

GPC Electronics cites the robustness of its systems as an important value-adding advantage. The manufacturer’s three plants have similar implementations of systems, processes and equipment. These plants are managed with a unified IT platform with ERP capabilities, allowing engineers in different locations to access and execute processes at the other facilities. Janssen says GPC Electronics is ISO 9000 accredited for quality management systems, and its systems ensure that it purchases only components from approved vendor lists supplied by clients. “Through our SAP system, we have a shopfloor control system. All the products we process are individually bar-coded and tracked,” Janssen explained. “We also capture all fault data and transaction data.”

“If we see the process has more faults than we’d expect, engineers in Australia can see what’s going on in China and email to tell them there’s an issue. We can then look at it and see if there’s a problem with the processes or the components.” This system also ensures the all-important Australian companies’ IP is protected. Horror stories whereby companies outsourced production to less-than-reputable manufacturers, only to find the market flooded with cheap copies made on the same equipment, using their design data, abound.

These service all increase the value of the OEM/CEM relationship. But perhaps the most valuable contribution CEMs can make is in the advice they give their clients .For example, CEMs have knowledge of which components have high failure rates, or know about design considerations that can reduce costs and improve the final product. Manufacturing efficiency is a major contributor to cost. CEMs can help clients reduce costs by improving manufacturability..

The electronics industry is at the forefront in the advance of technology. Costs are on a continual spiral downwards, and new design methods prompted by new components constantly challenge the capabilities of existing equipment In its report on electronics manufacturing in Australia, IBISWorld identified four key factors to success in this highly competitive industry. To thrive, or indeed, to survive, CEMs need to have access to extensive distribution channels, strengthen their brands, access the latest and most efficient technologies and techniques and establish export markets. For example, GPC Electronics set up its Chinese facility in 2008. This has not only provided customers with the option of lower cost manufacturing, but also allowed the company to gain clients in Europe and North America.

CEMs are essential for the good health of the electronics industry in Australia, and provide invaluable niche services beyond just manufacturing. Despite common perceptions of a dearth of manufacturing operations in Australia, a number of CEMs continue to thrive locally, powered by strategic vision, a constant willingness to go the extra mile for clients and constant investment in cutting edge technology. While CEMs currently face change and challenge, it seems ingenuity and a willingness to adapt to the situation will allow these operators to continue providing services to the design houses and electronic entrepreneurs of this country.

Once again, the Electronic Design and Manufacturing industry is widely spread around Sydney and includes the following:- GPC Electronics (Penrith); Inventis Gregory (Eastern Creek); Grantronics (Wentworthville); Elf Electronics (Richmond); Circuit Wise Electronics (Bella Vista); Ingenuity Electronics Design (North Ryde) ; Genesys Electronics Design (Pymble); Amatek

Electronics Design (Chatswood); Wavetronics (Riverwood); Electric Circuit Design (Matraville); the LX Group (Everleigh); and the Design to Production group (Rockdale).

Automotive

According to the *Australian Automotive Aftermarket Association (AAAA) Exporters Directory 2014*³⁵ Australia is a great source of quality product and aftermarket innovation and design. All of the design skills required to translate an idea into a tangible product are available in Australia. The world's auto makers and auto parts suppliers use these skills. Three auto makers – Toyota, General Motors and Ford – still have design centres based in Australia that utilise and enhance the talents of Australia's engineers. (See www.aaaa.com.au)

The industry exports over AUD \$700 million of equipment annually. For many years, these exporters have supplied their product to Australia's passenger motor vehicle manufacturers for original equipment fitment. Australia's automotive manufacturers are well known for their flexibility and agility, their ability to handle small volume production runs, their exploitation of niches in the aftermarket and being attuned to the current trends in the aftermarket.

Australia is a source of quality innovative aftermarket parts and accessories, including 4x4 parts and accessories, high performance & motorsport parts and accessories, lamps and lighting, brake components, filters, and suspension products. Australian automotive aftermarket manufacturers produce a comprehensive range of high quality parts, accessories, tools and equipment for all categories of vehicles.

Using these skills, Australia's automotive aftermarket manufacturers produce products for the global market to markets as diverse as North Asia, the United States, Europe and the Middle East.

Whilst it is well known that all three car makers will be closing down their manufacturing plants in Australia within the next two years, the opportunities are still there to develop and supply high value niche products and services for Asian Pacific manufacturers, if they can be provided either in real-time or with short lead times working by effective overseas air freight and JIT fulfilment processes delivered around a 24/7 airport.

According to the *AAAA 2014 Exporters Directory*, there are currently 14 members of the AAAA group in Western Sydney who are exporting overseas, which include for example: - Tough Dog (Blacktown) and Australian Ultimate Suspensions (Ingleburn); Nulon (Moorebank), Gulf Western Oil, and Concept Paints (St Marys); Rhino-rack(Rydalmere), Covercraft (Seven Hills) and Tridon Australia (Silverwater); as well as Disc Brakes Australia (Silverwater), Haltech Engineering (Wetherill Park), Hardiman Redline (Milperra) and Mainline Automotive Equipment (Smeaton Grange). (See www.aaaa.com.au for full details)

3.6 Life Sciences, Pharmaceutical Research & Manufacturing

Pharmaceuticals

According to *Medicines Australia* “The pharmaceutical industry is one of Australia’s most innovative industries. Currently, around 50 global research-based pharmaceutical companies and more than 400 locally-owned biotechnology firms operate in Australia. The industry employs thousands of highly-skilled Australians, generates billions in exports, invests millions of dollars in research and development and, most importantly, delivers medicines and vaccines that millions of Australians use every day to live longer, healthier and more productive lives”.³⁶

(See www.medicinesaustralia.com.au)

In the *Medicines Australia Facts Book 4 2015 Update*, they say that despite its successes, the pharmaceutical industry’s future in Australia remains uncertain. It faces a number of challenges which are threatening its future viability and its capacity to contribute to the health and wealth of this nation.

For instance, they argue that an increasingly unstable and unpredictable operating environment is putting extraordinary pressures on companies and, in many cases, discouraging them from investing in Australia. This has already contributed stagnant or declining investment in research and development and declining exports.

Unfortunately, they argue that this comes at a time of immense opportunity for Australia. Much of the growth in the market for medicines and vaccines over the next decade will come from Asia and Australia is uniquely placed to meet this demand. With the right policies in place, Australia could double its share of the global pharmaceutical market over the next decade. Without them however, Australia will most likely miss out on this once-in-a-generation opportunity.

Australia has a well-established reputation around the world for manufacturing safe, high-quality medicines and vaccines. Whilst in recent years, several pharmaceutical companies have closed manufacturing facilities in Australia, others have made significant investments in new and existing facilities.

Despite a recent decline, medicines and vaccines remain one of Australia’s biggest manufactured exports. The global market for these products is set to double over the next decade, with much of the growth coming from Asia. This presents a significant opportunity for Australia to grow its pharmaceutical exports

China is Australia’s largest market for medicines and vaccines, followed by South Korea, Taiwan and New Zealand. Recent free trade agreements with China and South Korea will make it more competitive for Australian manufacturers to export pharmaceutical products there.

Australia faces stiff competition for investment in pharmaceutical manufacturing. Countries such as Singapore offer significant incentives to attract this type of investment. Currently, Australia’s share of global outward trade in pharmaceutical goods and services is less than 1 per cent.

Despite its reputation for manufacturing safe, high-quality medicines and vaccines, Australia currently imports significantly more of these products than it exports. Growing manufacturing capacity would help Australia to maintain a healthy balance of trade in pharmaceutical goods and services in the future.

According to Medicines Australia, Australia's share of the global market for pharmaceutical products has remained stable at around 1 per cent over the past decade. However, it is projected to decline slightly over the coming years, mainly due to the lack of growth in the domestic market and the high rate of growth in other markets (particularly China, Brazil, Russia and India).

Sydney has some of world's leading research hospitals and is already home to most of the leading global pharmaceutical companies at Macquarie Park, Rydalmere, Rhodes and Villawood, with major smaller Australian companies such as LIPA Pharmaceuticals, Minto; Kenkay Pharmaceuticals, Narellan; Vitex Pharmaceuticals, Prestons; and Sci-chem International, Wetherill Park.

Complementary Medicines

According to Complementary Medicines Australia (CMA), complementary medicines currently contribute \$3.5 billion to the Australian economy, providing jobs and supporting local manufacturing. This figure is expected to grow to \$4.6 billion in 2017-2018.³⁷ See <http://www.cmaustralia.org.au/manufacturing>

Recently, free trade agreements have been negotiated with some of our Asian neighbours. There is no doubt that these free trade agreements can advance the growing Australian CMs industry, with significant potential to expand exports. Despite this, many obstacles, such as continued tariffs and regulatory controls, could still exist and constrict access to these markets.

Given this series of free trade negotiations with countries in Asia, CMA has initiated, on behalf of the complementary medicines industry, an 'export project', which focuses on target markets of particular interest to CMA members: China, Vietnam and Indonesia.

Following intensive research on these markets, CMA launched "Advancing Market Access for Complementary Medicines in Australia" in September 2014. The report includes the following:

- Examination of the nature of barriers to trade and investment faced by CM product companies in each of the target markets;
- Estimation of the size of the potential export market in each of the three countries that could result from more open markets and liberalization of barriers; and
- Details on the positions the Australian Government should take to remove these barriers and increase exports to the target markets.

Potential new export business opportunities with a 24/7 airport & supply chain market changes caused by digital disruption in the future

From our industry consultations, it is believed that there is significant potential for both pharmaceutical and complementary medicine research, manufacturing and distribution companies to relocate at least part or all of their operations closer to major distribution centres in

the WSEA for more effective distribution within Australia for the Australian eastern seaboard, and in the future around a new 24/7 airport in the WSEA for time-sensitive cargo.

Many of the major contract pharmaceutical companies such as LIPA Pharmaceutical are already located in Greater Western Sydney and complementary medicine companies such as Blackmores, Swisse, Caruso's and Vitex Pharmaceuticals have relocated some or all of their manufacturing and /or distribution activities to Eastern Creek.

For example Vitex Pharmaceuticals advise that their stock is transported by truck to contractors mainly in Eastern & Northern part of Sydney; containers are used to dispatch internationally to the port & airport; it is critical for them that there is timely connectivity to the appropriate destinations and that gridlocks are not delaying arrival of goods. They also import ingredients from other countries such as herbs from India and machinery for tablet pressing. Some of the key points in relocating to and operating from Eastern Creek have been:-

- Suitably priced and available serviced land (Note: However other companies have raised issues with lack of local amenities and administrative support facilities, and available transport to attract staff to work in the WSEA);
- Connectivity and timeliness of connections for staff and transportation of goods is a key factor in the business decision;
- Facilities at the airport that accelerate customs processing of goods and storage that caters for heat sensitive materials would support business;
- As yet, has no formal relationship with universities or research institutes; employs graduates mostly from WSU (science) however cast the net wide for good staff; train internally have blue collar & white collar workers; has in house laboratory.
- If there is a vision for what WSEA looks like and what role the airport will play then NSW government needs to provide incentives so that the right companies are attracted; Companies move to a location because of who is located in the area not necessarily to do business with but because they are seen as strong businesses;
- By comparison to other states, NSW government is not seen as supportive as it could be to potential manufacturers;

With respect to government, Medicines Australia have recently called on Australian policymakers to:

- ensure a stable, predictable and efficient business operating environment;
- strengthen Australia's intellectual property system;
- enable growth in the Australian biotechnology sector; and
- enact globally competitive incentives to encourage investment in R&D, high-tech manufacturing and public-private partnerships

We have been advised from our industry interviews, that Australia faces significant competition from countries such as Singapore and South Korea. Over 80% of the major R&D work is undertaken by the leading global pharmaceutical companies, and they can control where they spend their R&D development and establish future manufacturing sites. Australia has many benefits as a preferred location with respect to the developed market, lifestyle and availability of skills, but is losing out with respect to productivity, the ease and cost of doing business, the present bureaucracy and gateway import export transport costs both in and out of the country.

In support of this, Lisa McCauley CEO of Export Council of Australia has advised that currently, from their point of view, local bureaucracy and domestic export cost competitiveness is a major impediment at present for our exported manufactured products. Developing more streamlined export facilitation processes and systems with better facilities, and lower domestic cost and efficient inland transport to a new 24/7 airport will most certainly help.

With respect to the pharmaceutical and complementary medicines industry there is no doubt that better air connectivity through a second 24/7 airport will have a beneficial impact in the following ways:-

- opportunity for new streamlined customs and air transport freight systems
- quicker response times, costs and expenses in accessing markets
- ability to service the projected very large additional Chinese and Indian on-line consumer health market with high value branded health & complementary skin care, medicinal and supplement food products
- ability to hold seminars and conferences for relationship building
- easier to facilitate trade, have face to face meetings, develop better interaction and maintain commercial relationships, encourage more investment
- more productivity through real-time decision making, more interactive innovation and research projects, and development of intercompany financial, management and manufacturing control systems and processes

Note: Whilst the industry most certainly recognises the benefits of a future airport, they are adamant that we must do what we can to improve the current situation with what we have now, otherwise the long term benefits may be lost by the time the new airport is built. Apparently the lead time for many of these global pharmaceutical companies is very long with respect to future investment decisions, and they will need more confidence with respect to future infrastructure and market industry development.

3.7 Biomedical/ Bio tech/ Veterinary Products, Research and Testing

AusBiotech is Australia's biotechnology organisation, working on behalf of members for 30 years to provide representation and services to promote the global growth of Australian biotechnology. AusBiotech is a well-connected network of over 3,000 members in the life sciences, including therapeutics, medical technology (devices and diagnostics), food technology and agricultural, environmental and industrial sectors. Its membership base includes biotechnology companies, ranging from start-ups to mature multinationals, research institutes and universities, specialist service professionals, corporate, institutional, individual and student members from Australia and globally. (See www.ausbiotech.org)

The Medical Device Industry

AusBiotech reports that the medical technology industry is growing rapidly around the world. The increasing affluence of developed and developing countries, with people living longer and demanding a higher quality of life are all driving this growth.

According to Frost and Sullivan (2012) data the global advanced medical technologies market (medical devices, medical imaging and patient monitoring) was worth US\$342.8 billion, the Asia Pacific market (including Australia) was worth US\$63.5 billion (18.5% of the global market) and Australia's share was US\$6.81 billion (1.98% share).

There are more than 500 medical device companies in Australia. Of these, there are 34 ASX-listed medical device companies (39% of the ASX-listed life sciences market). Total market capitalisation of listed medical devices companies had reached A\$12.79 billion by October 2013 (PricewaterhouseCoopers, BioForum, Edition 45, Q1, FY14).

The Medical Technological Association of Australia (MTAA) also represents the medical technology industry, with members covering medical devices, diagnostics and medical imaging equipment, and comprising a diversity of manufacturers and suppliers of medical technology from emerging Australian companies to global companies. Medical technology saves and improves lives by detecting diseases earlier, and by providing more effective treatment options for patients and the healthcare system. (See www.mtaa.org.au)

The industry is characterised by a high level of innovation, resulting in short life cycles for many products. Many medical devices undergo constant development based on feedback from healthcare professionals and advances in other sciences relevant to medical technology.

According to the MTAA [2014 Fact Book Medical Technology in Australia: Key facts and figures in 2014](#), the Australian medical technology industry in 2014:-

- Turnover of approximately \$11.8 billion in 2012-13 (including IVDs and dental);
- Responsible for 43,952 medical device entries on the Australian Register of Therapeutic Goods (ARTG) (2014), estimated to represent between 500,000 and 1,000,000 different devices;

- Included over 500 medical technology companies with products listed on the ARTG;
- Employed more than 19,000 people;
- Mainly located in NSW (55%) followed by Victoria (24%) and Queensland (12%) ; and
- Imported goods to the value of \$5.59 billion and exported goods to the value of \$2.23 billion.

Globally, MTAA advise that the medical technology market is expected to grow at a compound annual growth rate of 4.5%, and achieve sales of US\$455 billion by 2018.

Medical device companies in Australia, with the exception of a few industry heavyweights such as Cochlear, ResMed and Cook Medical, are typically young and small, competing globally with large multi-national companies for market share. The medical device industry is one of the so-called sunrise industries. It ticks all the boxes on advanced manufacturing, providing high value-added products, with highly skilled labour and global production chains, for specialised markets.

The industry is also advancing rapidly into new fields of science and engineering, with nanotechnology and other research developments facilitating new innovations in the biomedical sphere and an increasing convergence of physical and biological technology platforms.

Global opportunities for the medical technology industry

Australia's medical device industry can list among its distinct competitive advantages its reduced time to market compared with drug discovery, its comparatively highly-skilled workforce and its geographic position within the Asia Pacific region.

Currently the major markets for medical devices are in the developed economies of the northern hemisphere (North America, Europe, UK and Japan). It is predicted that Asian markets will rival those of Europe and North America within 15 years.

Asian countries present fast-growing markets via their expanding middle classes and economic growth – and the size of the markets, such as China, are of interest to the Australian medical devices industry and its global orientation.

This opportunity prompted the Australian Government to release the *Australia in the Asian Century White Paper* (October 2012)³⁸, which was commissioned to analyse economic and strategic changes in Asia and how Australia can participate in the opportunities within the region. China has made a clear commitment to develop life sciences, with biotechnology one of seven priority industries in its 10th Five-Year Plan. China is keen to develop its science, technology or innovation, and wants to focus on developing intellectual property (IP) through partnering and investing.

Australia has the talent, technologies and business acumen to meet these needs. The partnering and investment opportunities between Australia and Asia, particularly China and Hong Kong, are compelling.

Australian Medical Devices & Diagnostics to China project

AusBiotech has been working in the Asian region on a small scale for many years, and recognising the importance of this region as a life science growth hub, ramped up efforts in 2013. AusBiotech won a federal government grant to conduct the Australian Medical Devices & Diagnostics to China project. The project aims to facilitate trade in medical devices with China by providing much needed information for Australian companies about IP management in China and the types of business structures that are possible for Australian companies entering China for the first time.

The project received funding from the Australian Trade Commission as part of the Asian Business Engagement (ABE) Plan and an application was made with partners FB Rice, Deloitte and the Burnet Institute. It is to be delivered via AusBiotech's AusMedtech and will be guided by a selected committee of industry experts from Australia and China and phased over three years. The project will produce an extensive report and a training module for Australian companies seeking to establish markets and/or businesses in China. It will also include an AusBiotech-led business mission to China in 2016 of Australian companies.

Agriculture & Food Biotechnology

According to AusBiotech, agricultural biotechnology and food technology represents a spectrum of the biotechnology's contribution to the food development process in Australia, from the farm to the plate. Applications of biotechnology are used to improve seeds and crops, and in food science to enhance our diets and provide functional foods for preventative health.

Modern agricultural biotechnology is providing benefits to farmers, the environment and consumers. Important improvements include helping farmers protect their crops from pests and diseases and reducing pesticide use. Increased yields of genetically modified (GM) crops also help to ensure a lower-cost supply of food for consumers and preserves natural forests, as well as providing a source of alternative fuels (bio-fuels).

Now, more than ever, we need tools such as agricultural biotechnology to produce more food fibre for a rapidly growing global population using less natural resources. To meet the growing needs of the world's population, farmers need to produce more food in the next 50 years than they have in the past 100 years combined.

Food science plays a role in community health by providing modified foods and beverages (fortified, enriched or enhanced), medical foods and foods for special diets. Functional foods are a growing field in food science due to advances in technology, health-conscious consumers interested in the relationship between diet and health, and the move towards preventative health and wellness in an ageing population.

Australia's food industry has a strong reputation and the capability to supply quality foods and ingredients. Collaboration between government, industry, universities and health institutions are helping Australia's food science sector prosper by encouraging innovation that delivers secure, safe and high-quality food and beverages.

The [plant science](#) industry provides products to protect crops against pests, weeds and diseases, as well as developing crop biotechnologies that are key to the nation's agricultural productivity, sustainability and food security. The plant science industry is worth more than \$17.6 billion a year to the Australian economy and directly employs thousands of people across the country.

[Agricultural biotechnologies](#), such as genetically modified crops, have the potential to transform agricultural productivity by delivering increased yields and lowering input costs. They can also improve environmental outcomes by reducing the need for inputs such as herbicides and water. Looking to the future, GM crops could better equip cropping systems to withstand drought, frost and other climate challenges.

[Biotechnology for animal health](#) is making an increasing contribution to the Global Animal Health (AH) field in the areas of vaccine development, diagnostics and biopharmaceuticals. The Global AH market was worth \$23 billion in 2013 and includes products for both livestock and companion animals with relative sales being split 60/40 between these species.

[Biopharmaceuticals](#) are becoming increasingly important for AH to improve the productivity and welfare of animals. While recombinant proteins have been used for many years we are now seeing peptide based products and monoclonal antibody technology becoming available for treatment in multiple species. The ability to rapidly speciate monoclonal antibodies and improvements in mammalian production systems, means that these types of therapeutics that are routinely used in humans can be made available for use in multiple veterinary species.

Potential new export business opportunities with a 24/7 airport & supply chain market changes caused by digital disruption in the future.

Recently in June 2016, the [Scientific American Worldview: A Global Biotechnology Perspective](#)³⁹ launched its eighth annual scorecard at the [BIO International Convention](#) in San Francisco, confirming Australia has held its place in the top five countries for the third consecutive year.

The Report said: "It might be down under geographically, but Australia finished in the scorecard's top five for the past three years. It also produced the 12th highest output on the Nature Index 2015 Global." AusBiotech's attraction of industry-building conferences was noted in the report: "Experts around the world recognise the biotechnology opportunities in this country, as some events demonstrate. In October 2016, for example, Australia will host [BioFest 2016](#), which is billed as 'the largest-ever gathering in Australian life sciences, with three major conferences coming together in one week in one place as one integrated network.'" The Report also ranked Australia fifth this year, measured by IP protection; intensity (ranked #3); enterprise support; workforce/education (ranked #4); productivity and policy & stability (ranked #2).

Like the pharmaceutical and complementary medicines industry there is no doubt that better air connectivity through a second 24/7 airport will have a beneficial impact on diverse range of industries operating within the biotechnology industry in the following ways:-

- Easier to facilitate trade, have face to face meetings, develop better interaction and maintain commercial relationships, encourage more investment;
- Quicker response times, costs and expenses in accessing markets;

- Overcome present inadequate transport infrastructure for the start-up SMEs who make up most of the industry. Enabling them to travel and connect more with their clients;
- Ability to service the projected very large additional Chinese and Indian on-line consumer health market with high value branded medical technology, medical devices, bio-tech, food and veterinary products and services;
- Ability to establish large scale interdisciplinary collaborative research projects and inter-government work programs working in real-time;
- More productivity through real-time decision making, more interactive innovation and research projects, and development of intercompany financial, management and manufacturing control systems and processes;
- Opportunity for more efficiencies through more streamlined customs, quarantine services, specialized refrigeration and air transport freight systems; and
- Ability to get more people to international seminars and conferences for relationship building.

Note: Whilst the industry recognises the benefits of a future airport, they also are adamant that we must do what we can to improve the current situation with what we have now, otherwise the long term benefits may be lost by the time the new airport is built.

Much of the bio-technology industry and life science research groups are presently not operating in Outer Western Sydney, but centred around the CBD at Ultimo, Camperdown, Randwick, Frenchs Forest, Macquarie Park, Norwest, Westmead, Rydalmere and Rhodes.

However, with the growth of the leading health & education research precincts around Westmead, Nepean and Liverpool hospitals, and to a lesser extent Blacktown and Campbelltown hospitals, there are progressively a growing number of additional medical technology and medical device companies establishing themselves in the Western Sydney region.

Food and plant technology, veterinary and pet food research companies on the other hand are already well established in Greater Western Sydney in Hawkesbury, Norwest, Penrith, Blacktown, Prospect, Girraween, West Hoxton, Bringelly, Cobbitty, Camden and Liverpool.

The NSW government DPI operates its Elizabeth Macarthur Institute at Wollondilly, and Western Sydney University and University of Sydney have research campuses with respect to food, agricultural products, veterinary science and plant production. Baiada and Inghams have poultry and avian research laboratories in Bringelly and Liverpool respectively.

Celestino, (the property group for the Baiada Group) has major plans to develop a new Science Park, commercial and residential town centre and precinct at Luddenham, to which they hope to attract international research entities including those in the biotechnology industry fields.

3.8 Agribusiness Research/Food Packaging & Processing

Agribusiness in Australia

Australia enjoys several advantages. Our geographic isolation and leading quarantine and monitoring regime help preserve a reputation for high quality production. Proximity to Asian economies, extensive free trade agreements and counter-seasonal production for the northern hemisphere means that trans-national companies sourcing from Australia can deliver produce throughout the year; this assists to drive demand for Australia's products in world markets.

Competitiveness for agribusiness is derived from locally-developed production methods and technologies and international research and development collaborations. Continual innovation in farm machinery, sophisticated plant and animal breeding programs and intelligent transport solutions underpin the ability of Australian agribusinesses to bring world-class commodities to market.

As a major exporter of agricultural produce and services, more than two thirds of agricultural commodities produced on farms are exported each year.

- Over the past twenty years, the production and exports of beef, wine and dairy products have increased significantly in response to growing overseas demand for higher value products.
- Our expertise and capability include: advanced technologies and infrastructure, water resource management, recycling and reclamation technologies.
- Australia is a logical supply source for agricultural products, food and biofuels. The professional farming community also represents an educated and reliable supply chain partner for international customers. Considering the extensive range of agricultural resources and rural production, there are significant new agricultural opportunities available within a stable investment and regulatory environment.

Urban Agriculture

With respect to Sydney's urban agriculture industry it has been estimated to be worth about \$1 billion (or about 12% of the NSW agricultural output) - mostly in poultry, dairy products, equine, plants, seeds, turf, horticulture, fruit and market garden vegetables. Much of the current market garden vegetable industry is presently grown in the WSEA area in small farm lots or in hydroponic glass houses around Badgerys Creek or around Horsley Park, Bringelly, Leppington and Kemps Creek.

However with Sydney's population of 4.5 million expected to grow by 1.6 million people in the next 20 years, local food production is further threatened by the need to house, and provide infrastructure for a growing population?

The food security of the Sydney Basin is under threat due to increasing reliance on distant production, distribution and transport systems, and increasing competition for land for housing in peri-urban areas. RDA Sydney has been working in providing the secretariat for the

Sydney Agriculture Strategic Approaches (SASA) working group, as well as being a supporter of the UTS Institute for Sustainable Futures led *Foodsheds Project*. The SASA working group is endeavouring to ensure that agricultural development options in the Sydney basin are recognized and strategically planned. The working group provides multidisciplinary advice to the NSW government about agriculture in Sydney particularly in the context of implementing *A Plan for Growing Sydney* and promotes peri-urban agriculture as a significant contributor to the NSW economy, employment, food security, a healthier society and amenity of Sydney. (See the interactive maps in www.sydneyfoodfutures.net).

The goal of the Mapping Sydney's Foodsheds project has been to increase the resilience of Sydney's food system to both global and local challenges. Project objectives are to:

- Develop, apply and map Sydney's current and future foodsheds
- Identify and evaluate feasibility and desirability of potential future foodsheds in the Sydney basin through local stakeholder engagement
- Create an evidence base to support councils, state and federal decision making to stimulate and support agricultural productivity in the Sydney Basin
- Increase the food literacy of consumers, related to farming, supply chain and health

This project has developed mapping to indicate where Sydney's current and potential food producing areas are located. A range of scenarios were modelled and mapped to indicate how, in different situations such as climate shocks, changes in diet and population growth for example, this will affect Sydney's food security. One of the main outcomes of this study has shown that by concentrating to a much more intensive agricultural farming model in precincts such as the Hawkesbury, Wollondilly, Wingecarrabee, and Central Coast it is possible to not only feed Sydney but provide opportunities for export particularly with a 24/7 airport with the appropriate supportive transport systems, quarantine processes and cold storage refrigeration warehouses.

Food Processing and Beverages

According to FIAL, the food industry has the potential to grow significantly due to the excellent reputation we have overseas as growers and manufacturers of quality food. "This is an exciting time for the food sector, for export markets which are rapidly growing as many countries in the world with high incomes are seeking quality food and health supplements, new brands and more healthy choices," said Najib Lawand, FIAL's General Manager of Markets Development.

"Free trade agreements and a great deal of support from government are also contributing to that growth. Every government agency with an economic development strategy has included the agribusiness sector in its priorities. So the level of support has never been higher. If SMEs are provided with the support needed they will thrive".

The food processing and beverage industry is one of the strongest manufacturing sectors in Greater Western Sydney. In NSW the industry has a turnover of about \$22 billion pa and employs over 50,000 people. GWS is home to several of the world's largest food and beverage manufacturing and site distribution multinationals-such as Campbell's Arnotts, George Westons Foods, Nestle, Fontarra, Osi-Foods, Unilever, Cadbury Schweppes, Diageo and Coca Cola Amatil; major local food manufacturing companies such as National Foods, McWilliams, Baiada Poultry, Cerebos, Goodman Fielder, Greens Foods, Primo, De Costi Seafood, Hans and Inghams Enterprises, as well as food packaging companies such as Amcor, and Visy.

Whilst there is a major presence of larger multinationals, there are a significant number of smaller market niche food manufacturers and exporters operating from Sydney and in the rest of NSW. According to most food companies interviewed, the prospects for economic development in the WSEA are positive because GWS has the capability and manpower that other regions lack, plus the space and capacity to grow, in terms of population and land availability. WSEA has the potential to attract food and other industries.

According to David Mumford from RBK Nutraceuticals, Greater Western Sydney is a great area to do business but that will only be enhanced by good infrastructure and the building of a new airport. Then the potential will be enormous. All manufacturers of health supplements said this is a fast growing sector. All companies interviewed were exporting to China and the US and said the prospects could not be better. Gourmet food exporters said however that their prospects were uncertain. While they did export, they reported finding it difficult to find their customer base overseas.

Potential new export business opportunities with a 24/7 airport & supply chain market changes caused by digital disruption in the future.

It is envisaged by industry contacts that digital disruption will result in the following changes in the market and supply chain structure for the food industry:-

- Access to markets and information will change dramatically with digitation. Online technologies will make it easier for consumers to learn about the products they are interested in. It will also enable companies to be better informed so that they take less risks and it will encourage them to innovate;
- Increased supplier–end user relations via business to business (B2B) direct connections;
- Increased just in time (JIT) in supply chain and for fresh perishables especially;
- Increased democratization of supply chains with small players gaining access to markets previously too difficult to manage;
- The provenance of food products, the safety message can be reinforced to consumers through digitation, this can improve the prospects of Australian businesses;
- There will be more online distributors of grocery products;
- Flexibility can be increased with digitation. The ability to work anywhere, connect with any country, have meetings through teleconference; and
- Digital disruption can only improve business development. The use of technology is always beneficial in terms of speed, efficiency and cost effectiveness. E.g. Jacky Donoghue from *Lively Linseed Products* suggested that a bilingual communication system should be developed for export negotiations e.g. one person is speaking English and the other person is hearing it in Mandarin.

Industry contacts also commented that being close to a new 24/7 airport would bring benefits to most industries that are now exporting or intending to export by:-

- Creating great new opportunities for food related businesses, in opening additional export markets for small and niche producers, particularly with the growth of e-commerce in China;
- Products able to be airfreighted will reach markets faster and cheaper;
- Infrastructure provision to support transport and temporary storage of commodities at a range of volumes/quantities make opting-in opportunity worth pursuing, even for small producers;

- The convenience of air routes which can get you to your destination at a more convenient time, particularly for business travelers, distributors;
- Additional capacity to handle air freight export. An attraction strategy for new companies to access the WSEA to be in food export cluster adjacent to supporting food marketing and freight forwarding and quarantine T&L industries;
- Kim Morgan, Marketing Director of Australian Culinary Foods, a company operating from Terry Hills, said that “having a new airport means they will avoid the *Mascot nightmare*, the congestion, pollution, time consuming trips and the stressful experiences of getting in and out of Mascot, which according to him, it puts many people off”. “Currently, exporting through Sydney airport requires extra planning, time and effort with extra freight charges and congestion! With BC the freight charges will be lower, the time faster and everything will be easier”;
- Shortening the flight times to and from Sydney will encourage more opportunities for businesses to meet clients face to face. Conference and meeting facilities needed to support this;
- More tourists and more consumers staying at hotels;
- According to some companies, there is opportunity to build the right facilities that can cater for chilled meat/seafood for 24 hour turn around to end user in Asia; there is a lot of internet shopping being done by Asian market where they buy small amounts frequently of chilled goods. According to Jacky Donohue, the new airport will be suitable chilled food market; and
- Opening real opportunity for dedicated fish and crustaceous farming adjacent to the airport.

To support these export opportunities it will be essential for the new airport to have:-

- Good road and rail access infrastructure with quick in and out last mile freight access that minimizes unloading congestion for high value products;
- Good warehouse cold/chilled facility which consolidates several producers freight, especially for high end products;
- Government to provide food inspection for export on site
- Meeting, export trade offices, accommodation and conference facilities for overseas buyers.

Agribusiness Research

As outlined in the previous section relating to *Agriculture & Food Biotechnology* in the *Biomedical - Bio tech/ Veterinary Products, Research and Testing* section, Australian universities and research centres has considerable internationally recognised expertise in agricultural biotechnology and food technology; food science, plant science, agricultural biotechnologies in genetically modified crops; animal health vaccines and diagnostics and biopharmaceuticals.

Within Sydney, the University of Sydney one of Australia’s leading agricultural faculties, which specialises in veterinary science, animal health, and plants at its farms and Plant Institute campuses at Camperdown, Cobbitty and Camden.

The Western Sydney University has identified a Western Sydney Innovation Corridor which includes its AgriPark research centre and campus at Hawkesbury, which specialises in food technology and stone fruit horticulture.

The UNSW has the ARC Industrial Transformation Training Centre (ITTC) for Advanced Technologies in Food Manufacture (ATFM) which was established in 2013 within the School of Chemical Engineering, specializing in food technology and engineering.

The Elizabeth Macarthur Agricultural Institute (EMAI) is the NSW Department of Primary Industries (DPI) Centre of Excellence for Animal and Plant Health. First opened in 1990, EMAI plays a vital role in the protection of Australia's economy, community and environment from animal and plant pests and diseases.

The Institute's facilities offer joint venture opportunities for primary industries research in plant and animal biosecurity. EMAI continues to help Australia to achieve and maintain the disease-free status that gains substantial advantages for our livestock and plant products in international markets. Laboratories monitor the disease status of the State's primary industries and provide certification for freedom from specific diseases.

Celestino, which is the property arm of the Baiada Poultry Group, presently undertake considerable avian research (as do Pepe Ducks and the Ingham Enterprises Poultry group). The Celestino group have planned a future major research Science Park with its own commercial and residential precinct, which will be located with its own town centre at Luddenham in the WSEA. They are seeking to encourage international investment into world class research facilities over a range of industries.

CSIRO's Food Innovation Centre is a major food innovation provider to Australia. Unfortunately, unlike at Werribee in Victoria and Coopers Plains Queensland there is a food research unit at North Ryde but there are presently no CSIRO Innovational R&D pilot plants in Sydney.

According to FIAL, for innovation centres and centres of excellence to evolve from the WSEA, there may be a need for a shift in the culture, particularly with industry-driven companies. There needs to be a culture of collaboration which has not been seen in food related companies. But the potential is there. It will depend on what sort of industries are attracted to the WSEA.

Companies interviewed said that there is a need for a combination of high tech, production industries that will complement one another and that see the potential to collaborate and the need for research and innovation. "What is needed as Western Sydney has not been successful in creating these centres or attracting the type of high tech industries that tend to innovate and collaborate. We need good infrastructure to attract them," said Mathew Fletcher, Director of The Food Company.

It is recommended that more needs to be done to encourage the development of collaborative food innovation research and industry development clusters with all of the key universities and CSIRO in GWS. In the case of the WSU Innovation Corridor the USYD, WSU and Celestino and Hawkesbury Agripark research facilities could be leveraged and the newly created sustainable agriculture and food systems degree, as an incubator and feeder initiative for new industry entrants and start-ups. It will be important to emphasize and support the entrepreneurial focus, knowledge domains, skills and attributes needing to be developed.

3.9 Building and Construction Materials/Resources/ Energy

Eco-Green Sustainable Building

According to the Green Council of Australia :”As world leaders in design, engineering, innovative products and technology, the Australian green building industry is an ideal partner in developing green projects globally. Australia has a well-established and growing green building market, with more than 12 million square metres of Green Star certified or registered green building space”.⁴⁰ (See Austrade’s Australia’s Green Building Capabilities)

Australian companies are leaders in:

- Masterplanning and precinct planning
- Sustainable building design innovation
- Environmentally Sustainable Design (ESD) engineering
- Project management and technical services
- Water capture, saving and storage systems
- Energy-efficient lighting, heating, ventilation and air-conditioning
- (HVAC) Insulation – including thermal mass regulation products
- Energy efficient hot-water systems – including solar and heat-pump systems, building management systems
- Provision of recycled, low toxicity and modular building products for construction

Nearly all of Australia’s leading edge sustainable building design companies are operating in Sydney. Most of Australia’s sustainable green building and materials companies have a presence in Greater Western Sydney, with many already established in the vicinity of Penrith, Blacktown, Holroyd, Fairfield, Liverpool or Campbelltown. In addition the major research and education facilities such as CSIRO, USYD, UNSW, UTS, UoW Smart Infrastructure and Western Sydney Universities all have major research capabilities.

There is an opportunity to develop a smart eco-green building materials and metal specialist industry cluster precinct near Bluescope Steel plant near Erskine Park.

Environmental Water, Waste and Renewable Energy

Already Greater Western Sydney, and in particular WSEA, is home to a diverse range of environmental water, waste and resource recovery management and renewable energy companies. Opportunities exist to further develop these industries to accommodate Sydney’s population growth.

Environmental Water Technologies

The Sydney Catchment Authority within the NSW government Sydney Water has major water infrastructure assets in Greater Western Sydney including Warragamba Dam, the Sydney water supply pipeline system and Prospect Reservoir. As a result there will be a long term interest for

international companies to have some of their operations within WSEA – particularly as a result of the recent announcement by the NSW government to raise the level of the Warragamba Dam.

Lux Research analyst Brent Giles in the firm's new analysis, *"Making Money in the Water Industry."* 2014⁴¹ reported that there were a wave of startup companies rising up to address the growing need for wastewater treatment and monitoring solutions, part of a \$600 billion industry that has traditionally been dominated by legacy companies such as GE, Veolia, Siemens (now Evoqua) and Suez. The report analyzed financial data from more than 150 large companies and activity involving 150 startups, across nine different sectors including wastewater monitoring and control, basic wastewater treatment, metals and organics recovery, and disinfection.

Like energy, water is one of those things that every company and community needs to worry about, especially in the face of future scarcity trends. The United Nations University Institute for Water, Environment and Health famously estimated that it will take an annual investment of \$840 billion to address water waste, pollution and management problems. Overall, the UN figures that about one-fifth of the world's population is challenged by water scarcity, and another 1.6 billion have limited access for economic reasons.

The Lux Research report suggests that almost one-quarter of all the new companies targeting this space are focused on monitoring, forecasts and process controls (through sensors and Internet of Things applications); roughly the same number is addressing basic wastewater treatment.

Most of the multinational and Australian owned water and waste treatment companies have offices and or/operations in Western Sydney, and play a part in the design and equipment installation of major projects around the world e.g. the Evoqua Membrane Technology plant in Windsor was born out of the original world renowned Memtec membrane technology.

Suez (Previously SITA)

SUEZ is a multi-national water, sewerage and waste recovery company with several waste recovery operations in Greater Western Sydney and in WSEA:- Advanced Resource Recovery Facilities at Kemps Creek just north of Elizabeth Drive and at Eastern Creek just east of the M7 at Wallgrove Road, as well as Resource Recovery Facilities at Seven Hills and Wetherill Park. See <http://www.sita.com.au/facilities>

The Next Generation (TNG) / Genesis Xero Project

A \$700 million plant that can generate electricity from building waste for more than 200,000 homes is also proposed for Eastern Creek. It is on a six-hectare site next to Genesis Xero waste disposal and recycling centre at Honeycomb Drive. The Next Generation (TNG) NSW company is headed by Ian Malouf who is also the owner of Genesis Xero, who claim they are committed to a sustainable waste and energy future. Further information about their EIS can be seen on its website www.tngnsw.com.au

The centre is the first of its kind in NSW and it is claimed it will eradicate the need for another landfill in metropolitan Sydney for up to 30 years. The TNG plant is based on generation plants that have been in operation across Europe and the United Kingdom for many years.

“Using waste that cannot be recycled from Genesis to power electricity our plant will divert about one million tonnes of waste away from landfill per year. ‘A plant of this kind would generate 140MW of ‘green’ electricity which is enough energy to power over 200,000 homes.”

In terms of future planning, there have been concerns raised by Sydney Airport with respect to the height of the two proposed incinerator stacks for the new plant, and the plant’s location in relation to the potential flight paths for the new airport.

Renewable Energy Technology Projects

Since the 1960’s, the CSIRO and Australian universities such as the UNSW, have led the world in the development of solar panel technologies, types of inverters, CSIRO gel-cell batteries, energy storage systems, lithium battery technologies and now more recently a new LWP technologies battery which is based on aluminium/graphene/oxygen technology.

Sydney is presently home to local offices representing the leading world clean energy technology companies, as well as spawning a significant number of Australian SME energy system technology companies.

Unfortunately, over the years Australia has not been able to capitalise on this by developing a sustainable global scale manufacturing industry base. Since the sale and closure of the BP Solar PV voltaic solar panel site at Sydney Olympic Park, most of the solar panels, inverters and energy storage systems are now imported from overseas – particularly from China, Japan, US, and Germany. Leading world solar technology companies are currently working with Australian retail energy companies and other Australian energy systems integrators to develop retail and commercial solar systems. Much of Australian-based manufacture of solar technologies has moved to Queensland, South Australia or Victoria.

Having said this, there is now considerable worldwide interest in developing the next generation of batteries. Companies like Tesla, Panasonic, LG and others are looking worldwide for partners to manufacture and bring to market new cheaper, environmental friendly and lower cost batteries for the next generation of IoT energy hungry computer data centres, electric cars, and renewable energy storage systems.

Further work is required to evaluate the potential of encouraging these technology companies to set up manufacturing and technology development in the GWS.

Section 4 AEROTROPOLIS- AN AIRPORT CITY

The Future Aerotropolis

In 2011, John Kasarda, who teaches at the University of North Carolina's Kenan-Flagler business school, published a book called "Aerotropolis: The Way We'll Live Next"⁴². It argues that airports are becoming anchors for a new type of city. Traditionally, airports have been built on urban fringes to serve pre-existing cities. Residents tend to think of them as necessary nuisances. Getting into the city from the airport is usually arduous and expensive: think of Heathrow, on the western edge of greater London, or O'Hare, along Chicago's northwestern fringes, connected to its city by a narrow, annexed strip of land.

These airports, and others like them, serve their cities but are not, in any real sense, part of them. The cities were already there, and they needed airports. So they were built somewhere outside the city, preferably surrounded by empty land, or at least by sparsely populated areas; and residents tolerated them, but the easier it was to get in, out and away from them, the better.

That paradigm, argues Mr Kasarda, is changing: cities are beginning to develop around airports. This development includes not just hotels and restaurants, but also, more importantly, transport-focused or transport-dependent businesses.

The following is an extract summarising some of the key points raised in his book:-

Kasarda believes that to serve the economic demands of connectivity, speed, and agility, the future aerotropolis will require localised infrastructure planning of unprecedented scale. To date, most have evolved largely spontaneously, with growing highway traffic and nearby development often creating arterial bottlenecks.

In the future, strategic infrastructure planning is required to reduce this congestion:-

- *Dedicated expressway links (aerolanes) and high-speed rail (aerotrails) should efficiently connect airports to business and residential clusters near and far;*
- *Special truck-only lanes should be added to airport expressways, with improved highway interchanges to reduce congestion;*
- *Multi-media technologies should produce themed electronic public art along airport transportation corridors that highlight the culture, history and economic assets of the region the airport serves;*
- *Regional marketing through informative and tasteful public art should likewise characterize the airport's terminals. By setting both the first and final impressions for many air travellers, the airport and its aerolanes represent an area's official welcome and send-off;*

- *Global information and communications technology (ICT) networks will also help shape the aerotropolis. Advanced information processing technologies and multi-media telecommunications systems served by high-density fiber-optic rings and satellite uplinks and downlinks will evolve around airports, instantly connecting companies to their global suppliers, distributors, customers, branch offices and partners;*
- *Companies that require the fastest possible networking will thus have an additional reason to locate in the aerotropolis. This ICT infrastructure is appearing not only around major passenger airports like Incheon and Washington-Dulles but also around US air express hubs such as Memphis (which serves global shipper FedEx) and Louisville (which serves United Parcel Service);*
- *As multi-modal transportation and advanced communications infrastructure further develops at and near airports, businesses will have even more reason to move to an aerotropolis. The principal determinant of land value, lease rates, and the type of commercial use on a given property will be the time and cost of moving people and products to and from the airport and, via the airport, to distant markets;*
- *The local time/cost proposition will be a function of the site's place along airport transportation corridors, and not necessarily of spatial distance. For example, a site 10 kilometres away, but one stop on a high-speed train line from the airport, will be worth more than a site five kilometres away with poor road and rail connections;*
- *To put it another way, the three A's – accessibility, accessibility, accessibility – will become the critical component of the three L's – location, location, location – in aerotropolis real estate value;*
- *Market connectivity is measured by a combination of the number of distant markets served and the frequency of service to these markets. Hence, an airport with five flights daily to a distant market will be better connected to that market than one offering two flights daily; and*
- *At first glance, one might misconstrue aerotropolis land uses as simply additional sprawl along main airport transportation corridors. In reality, the aerotropolis grows according to a rational system based on time-cost access gradients noted above, rather than spatial distance. It has both local form represented by commercial and residential clusters developing along corridors in the vicinity of the airport, and a broader regional economic development component represented by market access the airport provides to firms located up to 60 miles or more from the airport.*

Aerotropolis Planning Needs *Constructing appropriate multi-modal ground transit and locating commercial facilities consistent with the form and function of the aerotropolis will contribute substantially to the emerging needs of business, more efficient cargo and passenger flows and the future competitiveness of urban areas.*

These outcomes will not occur spontaneously, however. aerotropolis optimisation will require bringing together airport planning, urban planning, and business site planning in a synergistic manner so that development is economically efficient, aesthetically pleasing, and environmentally and socially sustainable.

To accomplish these development objectives requires not only good external infrastructure but also the creation of an effective aerotropolis working and living environment, as exemplified by Incheon's New Songdo City.

An improved physical and social environment must be created that:-

- 1. facilitates traffic flows in and out of the airport;*
- 2. aligns businesses in proximity to the airport in relation to their frequency of use of the airport;*
- 3. promotes fast airport access to both the downtown and airport-dependent enterprises located throughout the region;*
- 4. locates commercial and residential developments sensitive to noise and aircraft emissions outside high intensity flight contours; and*
- 5. creates mixed-use residential clusters where airport and airport-area employees can commute easily to work while residing in human-scale communities supported by adequate retail, service, and community facilities.*

Kasada concludes that the airport city and its broader aerotropolis are still in their earliest stages of evolution. Management and planning strategies are just beginning to catch up to the reality of their largely spontaneous development. The challenge now becomes to design and administer future airport city and aerotropolis development in a manner that it brings about the greatest returns to the airport, its users, and the larger region it serves.

Potential new business opportunities with a 24/7 airport & supply chain market changes caused by digital disruption in the future.

RDA Sydney broadly endorses the sentiments and ideas expressed in the above Kasada *Aerotropolis* book, and encourages both the Australian and the NSW governments to broaden the Airport Plan's scope recognizing Western Sydney Airport as the beginnings of an Airport City, which will attract trade oriented investment and increase technology employment - whilst attracting high-value real estate investment for hotel, office and international/trade uses.

Initially, due to the prominence and proximity of Kingsford Smith Airport to the CBD of Sydney, this Airport City will be relatively small by comparison providing the required functionality of an airport with respect to the initial passenger numbers proposed.

However it should be recognised at the outset, that this Airport City by 2031, will be a key North–South East/West transport/employment interchange for Greater Western Sydney between the NW and SW Growth Centres, and /or a central focal point between the regional cities of Parramatta, Liverpool, Penrith as well as Blacktown, and Campbelltown.

Whilst it will be imperative for the new airport to have high speed connectivity with Parramatta and the CBD of Sydney by rail and by road, this new Airport City will need to be planned as an essential cog (with its own sense of place and character), as the catalytic central hub within WSEA for *work, living and playing*, as well as a key destination to and from each of these regional centres.

RDA Sydney believe that the current Australian and NSW government-funded *Western Sydney Airport Rail Needs Study Group*, which is presently looking at the future rail needs to the airport and to the Western Sydney region overall, should not forget the future interconnectivity between the WSA airport, Bankstown airport and KSA for passengers and business travellers. It is also imperative that connectivity is ensured with any planned *Melbourne/ Canberra/Sydney/ Brisbane High Speed* rail project. For example any high speed rail project, such as the recently announced proposal by the Consolidated Land & Rail Australia (CLARA) group, should interconnect easily to WSA and KSA airports as well as Parramatta and the CBD.

As this is the case, it will be critical that the long-term planned and staged implementation growth of the Airport City within the WSEA (and its relationship to the broader growth of GWS), be planned over at least 30-50 years, taking into account the time in the future when the airport second runway is operational and the changes that will occur over that time in overall population and employment growth of GWS. At the same time, it will be critical to consider the way the rest of the Sydney metropolitan area will progressively change with other major infrastructure changes being planned and implemented.

We would also recommend utilisation of a *Virtual Sydney* 3D model such as the recently updated *RDA Sydney Virtual Sydney* 3D model as part of the strategic planning project, to help in visioning, in developing alternative scenarios by simulation and what if analysis. Countries such as Singapore are currently developing a Virtual Singapore 3D planning digital platform to do just this for their whole city. Used in conjunction with their 30 year masterplan, government agencies are working collaboratively on a unified 3D Masterplan with respect to land use; building development, transport and social infrastructure. <https://www.youtube.com/watch?v=9byatOVhgFk>.

RDA Sydney welcomes the opportunity to help provide access and use of their 3D model prepared by the AAM group which will be available as a base model online.

In this report we have not spent much time identifying the potential strategic industries that will be developed as part of the growth and development of the *aerotropolis* itself. This needs to be a separate study which should be undertaken as part of the master planning process.

Whilst KSA airport will remain as the leading airport gateway to Sydney for many years to come, the new *aerotropolis* for the WSA airport will need to build for itself an independent brand and reputation as vibrant leading 24/7 operational international airport city for Western Sydney. It is envisaged that the new WSA airport such as this will be able to differentiate itself domestically but also internationally, and entice additional tourists and business travellers (particularly from China and India) to Sydney from North Asia.

It is expected that the following additional business opportunities will need to be considered:-

- *Hotel, Conference & Offices*
With the airport operating 24/7 one would expect much more flexibility with respect to flight take-off and landing times and more additional flights from new international carriers - bringing tourists and business people who are seeking the convenience of staying for the day or overnight , attending a conference or doing business with Australian counterparts at the airport itself. (See comments and input from Australian companies in report)
- *International Trade, Finance & Banking*
As is the case in Europe and Asian airports, there will be opportunities for international trade shows, conferences and exhibitions, as well a range of office facilities for business *face to face* meetings and financial trade activities.
- *Commercial & Professional Services*

Because of the flexibility in flight times, our relative geographic position, and our relative mid-point 24 hour time position with North Asia (with respect to Europe and the US), the new WSA airport could become a critical hub for major business deals and project meetings - for example, large engineering companies, finance companies and big 6 legal consulting and accounting firms. This would also apply to the specialised commercial facilities for international freight trade forwarders, customs quarantine services, as well as the multitude of marketing and trade facilitator support businesses.
- *Retail & Residential.*
As well as the expected major retail shops one would expect at an international airport, there will be a need to be a range of high quality residential complexes with upscale retail within the vicinity of the airport for airport staff and employees. The planned Celestino Science Park will provide high quality residential living for its research precinct. It is envisaged that bulk of the airport employees will live locally around the periphery of the WSEA employment area in Leppington, Liverpool, Camden, Campbelltown, Penrith as well as Parramatta.
- *Health, Education and Training.*
As discussed earlier in Section 3.6 in the Life Sciences, Pharmaceutical Research and Manufacturing and Section 3.7 the Biomedical/Biotech/Veterinary Products and Research and Testing sections, Sydney has some of the world's leading medical research and teaching hospital precincts - which include Westmead, Liverpool and Nepean Hospitals. In planning the growth of the Aerotropolis one will need to consider building the necessary interim patient support facilities for international and interstate health treatment services and medical tourism.

International student education and research is and will be a major reason for visiting Sydney. As such, the WSA airport will be a student and research gateway for all of the potential strategic industry activities outlined in the other sections of this report. But it could also be a venue as a conference and /or teaching centre in conjunction with major universities, TAFE and other educational institutions - e.g. it would be of value to the international marketing of the WSU Innovation Corridor and the Celestino Science Park.

- Tourism, Sport & Leisure

The new WSA airport most certainly will offer itself as a leading national and international access point to tourists seeking an alternative access point to Sydney via different airlines offering additional flexibility in flight times facilities . Major sporting teams in Sydney such as the Penrith Panthers, GWS Giants, and Sydney Wanderers, have already voiced support with respect to the future use of WSA airport for interstate travel because of the perceived convenience in getting in and out of Sydney.

However a WSA airport would provide access to new and additional tourist attractions and experiences which could operate from the airport - such as the Blue Mountains, Western Sydney Parklands, Penrith White River Rafting & Rowing Venue, Wet 'n Wild, as well as the Eastern Creek Motor Sport Precinct, Golf courses, BMX tracks, Moto-cross and trail biking tracks etc. But it could also become the gate way to country NSW – to the West over the Blue Mountains and to the Southern Highlands and to eating experiences like those on the Hawkesbury Harvest Trail.

Note: Based on recent numbers put out in the Tourism Australia (June 2016 report), Chinese visitor numbers to Australia now exceeds those from NZ at 1.1 million per year growing at 22 per cent as at March 2016.

Section 5 RECOMMENDATIONS

5.1 Policy Recommendations to Government

RDA Sydney welcomes the recent pre-election announcement by the Turnbull Coalition Government that if re-elected, the Federal Government would partner with the NSW Government in a new City Deal for Western Sydney to grow Western Sydney around the development of the new WSA airport.

RDA Sydney agrees with both governments that the City Deal for Western Sydney could and should become the single largest planning, investment and delivery partnership in the history of Australia, in that it addresses the two critical challenges for Greater Western Sydney - stimulating massive job growth and creating better transport links between the region and the rest of Sydney.

However we would also say that it presents a once in a lifetime opportunity for Australia, for Sydney to not only maintain its global aviation megacity status in the rapidly growing Asian Pacific region; but also allow us to innovate, meet the challenges of digital disruption and rapidly grow the economy, capitalizing on the unique on-line product and services export trade and tourism opportunities that will present themselves in new found emerging country wealth in China and India.

In saying this however, RDA Sydney would also like to make the following initial comments:-

- The new WSA airport will be one of the most significant pieces of infrastructure ever built in Australia, which with new high-speed passenger rail, has the potential to improve connectivity all around Sydney as well as linking more people in GWS to jobs created around the airport;.
- Whilst we agree that the new WSA airport alone will create 39,000 new jobs over the next 20 years, we must aim to do much better and catalyze at least the additional 178,000 new homes and almost 200,000 new jobs that will be required to support the population directly around the airport - which is projected to reach over 1.4 million over this period;
- We welcome the goal for Sydney for “more affordable housing, new jobs closer to home, better transport and a more liveable city”;
- We agree that the “economic heart of Sydney needs to be moving West”, and that “the airport presents a once-in-a-generation opportunity for long-term growth in Western Sydney which will only be realised with tight coordination and integrated planning across all three levels of governments.”;
- We welcome the formation, of at least a joint-Ministerial Council with ultimate accountability for the *City Deal* supported by officials from all three levels of government including direct representatives of the Prime Minister and Premier. However, because of the complexity and longevity of this project we believe that an additional development authority and ongoing technical inter-government working groups will also be needed to assist both governments and the Greater Sydney Commission;
- We believe that both the Federal and State governments will need to consult much wider than just with the local councils to develop, communicate and maintain a vision for Western Sydney and agree on the goals, actions and investments required to deliver it;

- We support the leveraging of government investments in the airport, planned rail link and key transport infrastructure to make the land use changes and create investment incentives to achieve these ambitious housing and employment targets;
- We support the need to seek to leverage investment from the private sector and share the costs of key infrastructure required to unlock growth, housing and jobs, and share in the benefits;
- We congratulate the Federal Government on their new investment fund to accelerate clean energy, renewable energy and energy efficiency technology in cities through the Clean Energy Finance Corporation; and
- We encourage the Federal Government in the use of the \$50 million competitive Smart Cities and Suburbs program to support councils apply cutting edge technology solutions to improve services, urban spaces and liveability.

Policy Recommendations to the Australian Government

Realizing the potential of a project opportunity as large and as complex as this over the long term will not be easy, so with that in mind we make the following recommendations to the Australian government:-

- **Leadership**
Strong and committed leadership will be needed over the next 10-20 years by the Prime Minister and the Australian Government in establishing a lasting partnership structure with the NSW Government and with local government. This partnership structure should as far as possible have input and commitment from both sides of politics, and lock-in the long-term commitment of funds and resources, and the areas of intergovernmental and interdepartmental responsibilities.

Whilst it is clear that it is the responsibility of the Australian government to oversee the EIS, the tender process and the ultimate design, construction and operation of the new airport, the long term social and economic benefits of this project will ultimately only be realized in maximizing the beneficial growth of GWS and Sydney overall. It is therefore beneficial to have all levels of government committed to the broader long term planning and development of WSEA and GWS as a whole.

- **Intergovernmental and Interdepartmental Structure**
As stated previously, because of the complexity and longevity of this project we believe that an additional development authority and ongoing technical inter-government working groups will also be needed to assist both governments and the Greater Sydney Commission. It is essential that the framework for this established as soon as possible so that all parties more clearly understand their relative responsibilities. Progressively matrix-style inter-governmental and inter-departmental working groups with external specialist consultants should be brought together as required, to tackle specific complex planning and implemental matters that will unfold.

Developing a 3D Planning Vision

RDA Sydney recommend that the EIS and WSA Airport plan should reflect how a WSA airport will fit into the broader envisaged long-term vision of Sydney in 40-60 years when the population has grown to 7- 8 million with over 4 million people in GWS.

The airport will need to operate with a high degree of interconnectivity (having a new highly developed *aerotropolis* adjacent to the airport, which is well interconnected to local regional city centres such as Penrith, Liverpool, but with high speed connections to Parramatta, the CBD and the other airports at Bankstown and KSA.

We recommend that in developing our vision, we should be undertaking scenario modelling showing the various possible relationships with respect to the broader city urban spatial and transport plans and its economic development; so as to develop a better understanding as to how Sydney and NSW might look then, and how the future WSA airport operating with KSA and other city airports would or could cope.

To assist with this process, other countries and cities such as Berlin in Germany and Singapore, are developing 3D strategic planning models with flyover capabilities to undertake detailed what-if analysis and scenario-planning, and to also visualize and communicate to stakeholder's a more integrated seamless picture of how things might look and interact.

As an example the Virtual Singapore R&D program is a whole-of-government program that is co-driven by the Singapore National Research Foundation (NRF) Singapore Land Authority (SLA) and the Infocomm Development Authority of Singapore (IDA). The primary focus of this program is to develop a 3D city platform for use by the public, private, people and research sectors. The platform will enable users to derive insights, develop solutions and run simulations using realistic large-scale city model of Singapore. The program will support the development of semantically enriched 3D model of Singapore which includes detailed information such as texture, geometry and topology of city objects and terrain attributes. Advanced information and modelling technology will allow dynamic and real-time data to be incorporated on top of static city data. (Please see below for more details.)

See <http://www.aamgroup.com/blog/News/post/virtual-singapore-win/>

The AAM group, who have recently just updated the RDA Sydney Virtual Sydney 3D planning model to cover all of Sydney, are playing a leading role in this Singapore Government project.

RDA Sydney recommends to the Australian Government that as a key part of the planning for the *City Deal for Western Sydney* project overall, they invest in developing a Virtual 3D WSEA model, similar to the Singapore model, as Australia's digital 3D pilot project for the planning of future cities.

This Virtual 3D WSEA planning model could include the airport within WSEA, and link to the regional centres within GWS. It could be used to progressively plan the future growth of the airport within the overall WSEA region over the next 40-50 year- allowing *what-if analysis* for future land use, industry growth, and transport and social infrastructure up until the time when the WSA airport would have two runways fully operational.

- **Creating A Vision for Western Sydney**

In developing communicating and maintaining a *Vision for Western Sydney* as part of the City Deals process, we recommend that Australian and NSW State governments consult much wider than just with the local councils to develop, communicate and maintain the vision and agree on the goals, actions and investments required to deliver it. We recommend that it should include the development of a broad framework with input gathered by the EIS process and include business, union and community stakeholder groups across Sydney as well as those represented by the Western Sydney Airport alliance.

Any such vision should include an *Economic Development Vision for GWS Sydney and Australia* around the new export opportunities. As in Singapore, a Virtual 3D WSEA planning model can be used for interactive ongoing community engagement and communication.

- **Building /Design/ Operation of the airport**

In finalizing the EIS and the final tender process we recommend that the Australian government:-

- Build a world class leading-edged designed international airport which is environmentally sustainable, and which shows off Australia's competencies to the world. Endeavour to use leading-edge Australian engineering designed products and services;
- Design, build fit out and equip a world class leading-edge airport capable of starting small with one runway (10 million passengers per year) but growing rapidly over the next 30-40 years;
- NSW has several internationally capable designers and suppliers of ground support equipment – develop a new export-oriented equipment systems design/supply cluster integrated with airport design architects potentially able to design the new airport around a new baggage handling solution
- Design and build a complementary road/rail transport network to maximize the efficiency of the airport and the growth of GWS and WSEA as a whole;
- Like in Hong Kong, design in flyover type transport access roads to separate passenger and freight operations;
- Modify the final WSA airport EIS design tender to take into consideration the potential overall long term 50-60 year economic vision for GWS and Sydney, and the potential airport masterplan for WSEA, which can accommodate the range and types of potential strategic industries that we have identified in this report;
- Create airport around a future designed planned *Aerotropolis*;
- Design in Australia's major project *best practice* procurement policies and code of practice to ensure "whole of life" project costs considerations;
- Build in opportunities to expand Australia's aerospace and global aviation OEM supply and maintenance capacity and capabilities;
- Build new aircraft hangers of sufficient size to cater for the largest aircraft with associated support equipment built-in for maintenance and repair of current and future aircraft;
- Build in opportunities to grow Australia's international pilot, aviation industry, and aircraft engineering training industry;

- Critically use the airport design to maximize the effectiveness and efficiency of air freight logistics out of Sydney to world-class standards. Air freight terminals with built-in flexibility for rapid capacity growth;
 - Air freight terminals have capacity to process diverse export and import traffic, including livestock with corralling and penning facilities in surrounding vicinity as well as appropriate quarantine facilities;
 - For agribusiness, adjacent infrastructure in place to support transport and temporary storage of commodities at a range of volumes/quantities making opting-in opportunity worth pursuing, even for small producers;
 - Specialized storage and refrigerated goods facilities to cater for chilled goods including meat and seafood, as well as other high-value products such as pharmaceuticals;
 - Terminal capable of handling international exhibitions, business meeting rooms, executive offices, export trade offices, hotel accommodation and conference facilities for overseas buyers.
- **Future Airspace Protection**

RDA Sydney support concerns raised by Sydney Airport Corporation that the airspace surrounding the future airport, must be protected from inappropriate development, to ensure the safety of aircraft and airline passengers and to provide for future growth. We agree with SAC that whilst declaring the WSA's Obstacle Limitation Surface is an important step to enabling WSA's airspace to be protected, declaring other surfaces – and in particular the PANS-OPS – is vitally important. Without these surfaces being formally declared, the airspace required for optimal future operation of WSA will not be protected.

As a matter of priority, we ask the Australian Government to deal with this matter through finalization of the Airport Plan. However, until the final flight paths and procedures have been determined (which is expected to be several years away), some surfaces, and especially the PANS-OP, cannot be declared. We consider that it would be appropriate for the Commonwealth to consider interim protections for these airspace surfaces, in advance of them being formally declared.

The NSW and local governments also have an important role to play in protecting WSA's future airspace. It is vitally important that these governments avoid decisions now that would see WSA's future airspace compromised.

We urge the Australian government to work as soon as possible with Air Services Australia and CASA, to develop and determine the appropriate policy frameworks for future aircraft flight paths, and at the same time, work out with industry consultation a new regulatory regime and framework for the operation of UAV and UAS craft adjacent to a new airport.

• **Transport Connectivity**

In consideration of current and future funding by the Australian Government into transport connectivity i.e. road rail and intermodal infrastructure we recommend the following:-

- Consider the future road and rail needs to the airport and the GWS region as whole with respect to growth;

- High speed connectivity with Parramatta and the CBD of Sydney by rail and by road;
- The Airport *Aerotropolis* planned as an essential cog (with its own sense of place and character), as the catalytic central hub within WSEA for *work, living and playing*, as well as a key destination to and from each of these regional centres;
- Ensure the future interconnectivity between the WSA airport, Bankstown airport and KSA for passengers and business travellers;
- Connectivity is ensured with any planned *Melbourne/ Canberra/Sydney/ Brisbane High Speed* rail project
- Support the design and building of new additional intermodal terminals at Eastern Creek and ultimately at Badgery's Creek alongside the WSA airport; and
- Support the establishment of an *Air Freight Efficiency Working Group* to make immediate recommendations for streamlining and improving the existing air freight system and to develop potential new operations and procedures that could be designed into the new airport.

- **Infrastructure that helps achieve the Vision**

RDA Sydney recommends to the Australian Government in their efforts to develop with the NSW Government a new vision for Western Sydney they:-

- Treat GWS as a fresh platform to grow startups and new enterprises;
- Do their best to help solve the transport issues;
- Seek to provide the best 21st century infrastructure – such as ultra-high speed broadband, attractive mixed-use living/working precincts, and industrial co-working spaces and smart industry clusters sharing high-value infrastructure.
- Amenity and spaces that offer mixed residential, co-recreational and co-working, green, retail and light-industrial all within close walking distance of each other and of high-speed transport hubs;
- More school and university options for families, and more and higher-quality recreational facilities;
- Affordable, sustainable local housing; and
- Encourage environmentally sustainable energy policies

- **Aerospace /Defence**

RDA Sydney through SADIG seeks support from the Australian government to rapidly expand Sydney's existing aerospace/defence industry capabilities:-

- Develop major additional global aerospace and defence OEM supply and MRO maintenance capacity and capabilities around a new airport utilizing the latest new materials and technologies;
- Develop a new US styled NASA autonomous systems and space hub centre in Sydney with a UAV test facility near the airport; and
- Finalize the establishment with DSTG and the Department of Defence, a NSW Defence Science Institute (like Victoria) with industry and university research institutions, the NSW Chief Scientist's office and the NSW DoI to accelerate opportunities nationally and internationally for NSW.

- **National Space Policy**

RDA Sydney through SADIG seek Australian Government support to further develop the NSW space capabilities as part of the new Australian government National Space Innovation Policy and Strategies currently being updated. This includes the uptake of A+S2.0 projects - particularly in developing new uses and new technology algorithms, software and process systems which could be implemented using small low-cost cube satellite technology. For example two satellites INSPIRE-2 Cubesat and UNSW-ECO Cubesat made by USYD, UNSW and ANU are scheduled to be launched into space on 30 December 2016 from the east coast of the USA and to be deployed from the International Space Station in January 2017 as part of the QB50 project - a coordinated launch of 50 Cubesats to conduct integrated space research studies. The QB50 launch will be the first launch of Australian built and operated Cubesat spacecraft.

- **Innovation / Industry Policy Intervention as part of the City Deal**

RDA Sydney recommends to both the Australian and NSW governments that they need to consider a range of new Innovation/ Industry policy interventions as part of the City Deal for Western Sydney.

To achieve the aspirational changes sought, we believe that it is imperative that we need to build on the current industry comparative advantages for the WSEA /GWS region identified in this report, and stimulate activity over time to create Western Sydney as Australia's new age world-class industrial region.

We believe the way forward is to create a new Startup Eco-system for Sydney built around the San Diego UCSD model discussed in this report from which we can expand and develop new innovation precincts and collaborative industry clusters in WSEA and GWS.

Like the San Diego region, the geographic distribution of companies in many industry sectors across Sydney are wide-spread, with clusters not necessarily in one place. The economic success of *CONNECT-San Diego* to become a leading innovation powerhouse over the past 30 years has been the central overlay of a whole range of innovation acceleration activities built around six elements namely business creation, venture capital, educational curriculum, innovation policy, recognition and competition, and convergent clusters. (See examples in 5.3 Best Practice Connect-San Diego)

There are several new collaborative industry clusters that have been identified in this report in aviation, aerospace/defence, transport & logistics, digital industries, advanced manufacturing and electronics, pharmaceuticals and biomedical technologies, agribusiness and food technologies and sustainable building. There is no doubt that as far as the economic growth of GWS goes, one of the key steps is to form a Startup Ecosystem for Manufacturing which builds on the significant existing capabilities. These are discussed in more detail in the next section (5.2 Further Work – Next Steps).

To assist the above we believe that at least following government intervention and support be included:-

- Support the upfront costs of facilitation and formation of these industry clusters, and development of industry capability databases & websites;
- Support the development of innovation acceleration activities within Sydney which can help with these six elements - business creation, venture capital, educational curriculum, innovation policy, recognition and competition, and convergent clusters.
- Support the development of Centres of Excellence within WSEA with leading edge JV research capabilities that offer low- or zero-cost access to high-value infrastructure – for test, manufacturing or certification –ideal for the WSEA;
- Encourage university /industry collaboration by changing university research funding KPI's for time spent by researchers with industry;
- Co-invest with NBN to provide faster internet services sooner within GWS than elsewhere in Sydney – and in particular, look at digital connectivity issues with existing and recent building developments;
- Keep abreast of worldwide digital disruption trends. Support the development of shared digital communications and service platforms;
- Invest in co-working spaces ideally "tech-shop"-style maker spaces – in partnership with local manufacturers and engineering firms, to help unblock silo thinking and increase the number of network nodes and connections between existing, legacy, and next-generation firms in the region;
- Seek the potential to develop new entire industries around IoT, exporting know how to other markets globally. This will only occur if IoT strategies and information architectures are built into the design of the airport and other enabling spaces and systems from the outset.

• **Australia's Trade Competitiveness**

RDA Sydney recommends to both the Australian and NSW governments to investigate the issues raised with respect to air connectivity and export trade competitiveness by many of industry bodies and companies interviewed in the preparation of this report. In most cases, there is concern now about unnecessary bureaucracy; domestic cost competitiveness, and inefficiencies in air freight, quarantine and customs which are impacting export businesses, and causing missed opportunities in winning business overseas.

We implore both governments to actively engage with the industry working groups outlined in section 5.2 Further Work- Next Steps, in resolving some of the issues now but also in developing new streamlined processes and systems for the new WSA airport.

• **Digital Disruption, Human Capital & Skills Development**

RDA Sydney recommends to both the Australian and NSW governments that they need to consider the impact of digital disruption and so called *Fourth Industrial Revolution* on the future needs of human capital and skills as part of the City Deal for Western Sydney.

According recent reports including the World Economic Forum (WEF) Report "*Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution*" January 2016, the CEDA Report *Australia's Future Workforce* June 2015, and the ACS /Data 61 Report *Tomorrow's Digitally Enhanced Workforce* Jan 2016, significant changes are

coming with respect to technology, with implications that it will affect the very nature of work as we know it, the numbers and different types of future jobs, and the skill sets required.

As these reports highlight there will be massive disruption with estimates that 65% of children entering primary schools today will ultimately work in new job types and functions that currently don't yet exist. Technological trends will create many new cross-functional roles for which employees will need both technical, and social and analytical skills. Government needs to rethink the current education systems and work closely with business, education providers and others to imagine what a true 21st century curriculum might look like.

We encourage both governments to invest in the development of these new 35 skills outlined in the WEF Report, at a much earlier stage in primary schools - STEM skills, computer coding, understanding IoT, 3D printing prototyping, and entrepreneurial skills.

This means creating a new *Centres of Excellence* in Sydney for training STEM skilled science teachers rapidly improving school industry interaction and collaboration, and funding support for programs such as the *F1 in Schools Technology Challenge*, *Zero Gravity Robotics*.

Policy Recommendations to the NSW Government

- **Leadership and Committed Partnership**

Strong and committed leadership and a committed partnership will be needed over the next 10-20 years between the Prime Minister and the Australian Government, the NSW Premier and the NSW Government in establishing and maintaining a lasting partnership structure between both governments and with local government. This partnership structure should as far as possible have input and commitment from both sides of politics, and lock-in the long-term commitment of funds and resources, and the areas of intergovernmental and interdepartmental responsibilities.

It is beneficial to have all levels of government including the Greater Sydney Commission committed to the broader long term planning and development of WSEA and GWS as a whole.

- **Intergovernmental and Interdepartmental Structure**

As stated previously, because of the complexity and longevity of this project we believe that an additional development authority and ongoing technical inter-government working groups will also be needed to assist both governments and the Greater Sydney Commission. Progressively matrix-style inter-governmental and inter-departmental working groups with external specialist consultants will need to be brought together as required, to tackle specific complex planning and implemental matters that will unfold. It is essential that the framework for this be established as soon as possible so that all parties more clearly understand their relative responsibilities

- **Developing a 3D Planning Vision**

Following the same recommendation made to the Australian Government, RDA Sydney recommend to the NSW government that the EIS and WSA Airport plan and the Vision for Western Sydney should reflect how a WSA airport will fit into the broader envisaged long-term vision of Sydney in 40-60 years when the population has grown to 7- 8 million with over 4 million in GWS.

We also recommend that as a key part of the planning for the *City Deal for Western Sydney* project overall, they should co-invest in developing this Virtual 3D WSEA model, similar to the Singapore model, as Australia's digital 3D pilot project for the planning of future cities.

In addition however, we would encourage the NSW government, through the Greater Sydney Commission, to work with RDA Sydney to have its new cloud-based Virtual Sydney 3D Planning Model developed by the AAM group as an access base model for all to use in planning and developing metropolitan Sydney. This cloud based model with the latest terrain data is at a stage where it is ready for preliminary discussions.

- **Creating A Vision for Western Sydney**

In developing communicating and maintaining a *Vision for Western Sydney* as part of the City Deals process, we recommend that both the Australian and NSW State governments consult much wider than just with the local councils to develop, communicate and maintain the vision and agree on the goals, actions and investments required to deliver it. We recommend that it should include the development of a broad framework with input gathered by the EIS process and include business, union and community stakeholder groups across Sydney as well as those represented by the Western Sydney Airport alliance.

Any such vision should include an *Economic Development Vision for GWS Sydney and Australia* around the new export opportunities. As in Singapore, a Virtual 3D WSEA planning model can be used for interactive ongoing community engagement and communication.

- **Greater Sydney Commission**

RDA Sydney welcomes the Greater Sydney Commission into their new planning authority role for Sydney. We look forward to working with the Greater Sydney Commission in the redevelopment of the six new District Plans and the ultimate reviewing and updating of the *2014 Metro Strategy – A Plan for Growing Sydney*.

With respect to the planning role that they will play with the new WSA airport, we recommend the findings of this report with respect to the potential strategic industries into WSEA, and trust that it will be invaluable in their work.

- **Future Airspace Protection**

RDA Sydney support concerns raised by Sydney Airport Corporation that the airspace surrounding the future airport, must be protected from inappropriate development, to ensure the safety of aircraft and airline passengers and to provide for future growth. (See earlier recommendations to the Australian government).

We recommend the NSW Government, the Greater Sydney Commission and local government develop and enact a policy framework which will protect WSA's future airspace so as to avoid decisions now that would see WSA's future airspace compromised.

- **WSEA Planning**

RDA Sydney makes the following recommendations to the NSW Department of Planning and Environment, and the Greater Sydney Commission with respect to planning policy as it relates to the planning of the WSEA and the Western Sydney Priority Growth Areas (WSPGA) :-

- With respect to land uses – objectives and permissible uses, we believe it is imperative to consider not only the potential land-use growth within the airport itself, but also with respect to how it will grow and develop within the adjacent broader economic region (ie WSEA) over time and be interconnected through well-defined freight and transport corridors, airport business and logistics precincts and/or districts;
- As per our background papers, development should be organized around a clear vision. This vision guides the development of a set of development principles. These principles, when combined with the constraints and opportunities growing out of the physical/environmental context, the policy environment and the political environment, allow the identification and evaluation of broadly defined development opportunities. These then lead to the planning, design and implementation of specific projects.
- Development plans should be developed taking into account the potential strategic industries and land uses that could be accommodated as a result of this report; outlining the planned and proposed creative, business and commercial, manufacturing and logistic corridors, areas and districts.
- The new WSA airport should be planned to grow and develop within these defined commercial, industrial and logistics precincts within a broader WSEA region adjacent to the airport, the NW SW growth centres, and the regional cities of Penrith and Liverpool and Parramatta. This vision would then define a set of development principles as mentioned above from which these precincts would be progressively developed over time in parallel with the development of the airport.
- Land in the vicinity of the WSA airport needs to be appropriately zoned to permit a range of airport and aviation support land uses outlined in this report to be developed.

- The Broader WSEA Structure Plan 2013 and the WSEA Economic Drivers Report should be upgraded in line with the development plans mentioned above.
- In line with the current *2015 Employment Lands Development Plan Program (ELDP)* Report, the number of planned B7 type Business Parks within WSEA and WSPGA needs to be reviewed. We are going to need a more balanced land use zoning like it is in the *Clayton Industry Land* precinct in Victoria - to accommodate new *Centres of Excellence* research facilities, Business and Science Parks, Specialist Centres over and above those proposed at Bakers Lane and Luddenham. These new types of industries and facilities will need a mixed range of zoned and serviced land with different power, gas and water utility requirements, and road /rail transport infrastructure.
- This new updated revised masterplan should take into account the undulating topography of WSEA in certain areas, the flood plains and necessary riparian corridors. As a result, it will necessitate the revision of the ELDP program land zoning and servicing targets. Priority needs to be given to progressively ensuring the supply of suitably zoned and serviced business park and employment land is ahead of supply particularly as the demand is likely to pick up quickly now that decisions about the planning for the WSA airport is being determined.
- *Agricultural Land use Policy & Zoning* - land use conflicts still remain a major challenge, and the prioritization of agricultural industries in the metro strategy is yet to be realized. We recommend that more consultation is needed to maintain zones for intensive agricultural activities near the airport. The land available for such uses will need to be sufficient to ensure such land uses can expand as the airport grows.

- **Transport Connectivity**

In consideration of current and future funding by the NSW Government (and the Australian Government) into transport connectivity i.e. road rail and intermodal infrastructure we recommend the following:-

- Consider the future road and rail needs to the airport and the GWS region as whole with respect to the population and the progressive new additional employment growth that will occur both within WSEA but also in the NW and SW Growth Centres and the Regional Centres - this includes potential north-south and east-west movement for both passengers and freight.
- High speed connectivity with Parramatta and the CBD of Sydney by rail and by road;
- The Airport *Aerotropolis* be planned as an essential cog (with its own sense of place and character), as the *catalytic central hub* within WSEA for *work, living and playing*, as well as a key destination to and from each of these regional centres;
- Ensure the future interconnectivity between the WSA airport, Bankstown airport and KSA for passengers and business travellers;
- Ensure future connectivity with any planned *Melbourne/ Canberra/Sydney/ Brisbane High Speed* rail project

- Support the design and building of new additional intermodal terminals at Eastern Creek and ultimately at Badgery's Creek alongside the WSA airport;
- Support for the formation of a new TfNSW led Freight Working Group similar to the Port Botany Landside Improvement Strategy (PBLIS), to review the present and future development of the proposed intermodals and those planned in the WSEA at Ropes Creek and at Badgery's Creek in the future and provide advice as to the necessary site requirements, boundaries and offsets, infrastructure, and transport corridors to interface with an efficient airfreight & customs terminal at the new WSA airport.
- Support the design of dedicated freight transport lanes and or corridors within WSEA for rapid and effective intermodal air freight activities freight; and
- Support the establishment with the Australian Government of an *Air Freight Efficiency Working Group* to make immediate recommendations for streamlining and improving the existing air freight system and to develop potential new operations and procedures that could be designed into the new airport.

- **Infrastructure that helps achieve the Vision**

RDA Sydney recommends to the NSW Government that they also adopt the following aspirational vision for Western Sydney:-

- Treat GWS as a fresh platform to grow startups and new enterprises
- Do their best to help solve the transport issues
- Seek to provide the best 21st century infrastructure – such as ultra-high speed broadband, attractive mixed-use living/working precincts, and industrial co-working spaces and smart industry clusters sharing high-value infrastructure.
- Spaces that offer mixed residential, co-recreational and co-working, green, retail and light-industrial spaces all within close walking distance of each other and of high-speed transport hubs
- More school and university options for families, and more and higher-quality recreational facilities
- Affordable, sustainable local housing

- **NSW Innovation Industry policy – Connect San Diego**

As stated previously, RDA Sydney recommends to both the Australian and NSW governments that they need to consider a range of new Innovation/ Industry policy interventions as part of the City Deal for Western Sydney.

To achieve the aspirational changes sought, we believe that it is imperative that we need to build on the current industry comparative advantages for the WSEA /GWS region identified in this report, and stimulate activity over time to create Western Sydney as Australia's new age world-class industrial region.

We believe the way forward is to create a new Startup Eco-system for Sydney built around the San Diego UCSD model discussed in this report from we can expand and develop new innovation precincts and collaborative industry clusters in WSEA and GWS.

Like the San Diego region, the geographic distribution of companies in many industry sectors across Sydney are wide-spread, with clusters not necessarily in one place. The economic success of *CONNECT-San Diego* to become a leading innovation powerhouse over the past 30 years has been the central overlay of a whole range of innovation acceleration activities built around six elements namely business creation, venture capital, educational curriculum, innovation policy, recognition and competition, and convergent clusters. (*See examples in 5.3 Best Practice Connect-San Diego*)

There are several new collaborative industry clusters that have been identified in this report in aviation, aerospace/defence, transport & logistics, digital industries, advanced manufacturing and electronics, pharmaceuticals and biomedical technologies, agribusiness and food technologies and sustainable building. There is no know doubt that as far as the economic growth of GWS goes, one of the key steps is form a Startup Ecosystem for Manufacturing which builds on the significant existing capabilities. These are discussed in more detail in the next section (5.2 Further Work – Next Steps).

To assist the above we believe that at least following government intervention and support be included:-

- Support the upfront costs of facilitation and formation of these industry clusters, and development of industry capability databases & websites;
- Support the development of innovation acceleration activities within Sydney which can help with these six elements - business creation, venture capital, educational curriculum, innovation policy, recognition and competition, and convergent clusters.
- Support the development of Centres of Excellence within WSEA with leading edge JV research capabilities that offer low- or zero-cost access to high-value infrastructure – for test, manufacturing or certification –ideal for the WSEA;
- Encourage university /industry collaboration by changing university research funding KPI's for time spent by researchers with industry;
- Co-invest with NBN to provide faster internet services sooner within GWS than elsewhere in Sydney – and in particular, look at digital connectivity issues with existing and recent building developments;
- Keep abreast of worldwide digital disruption trends. Support the development of shared digital communications and service platforms;
- Invest in co-working spaces ideally "tech-shop"-style maker spaces – in partnership with local manufacturers and engineering firms, to help unblock silo thinking and increase the number of network nodes and connections between existing, legacy, and next-generation firms in the region;
- Seek the potential to develop new entire industries around IoT, exporting know how to other markets globally. This will only occur if IoT strategies and information architectures are built into the design of the airport and other enabling spaces and systems from the outset.

- **Strategic Industry Development**

In the next Section 5.3 Further Work – Next Steps, RDA Sydney has made a number of recommendations for each of the potential strategic industry groups identified, with respect to the necessary follow-up work and or activities required to progress the ideas raised, and to the level of support sought in most cases from the NSW Government.

5.2 Further Work- Next Steps

Section One - Aviation Industries

- RDA Sydney to immediately seek meetings with key agencies within the Australian and NSW governments with respect to potential strategic industries that could be developed with the new airport, to ensure that the Australian proposed airport tender takes into account these potential opportunities.
- RDA Sydney to organize, with the support of the key industry association partners, a major Aviation Industry workshop and interest group, to further scope the opportunities of growing the aviation industry long term in Australia and the Asian Pacific. It will look at the opportunities that will come with the second WSA airport, and to develop a framework for actions and decisions required now.
- RDA Sydney seeks support from the NSW government to build an Aviation Industry cluster with capability profiles for Australian and in particular NSW capable airport and airport equipment designers and suppliers of ground support equipment– highlighting strengths to successful lessee of Western Sydney Airport for future business opportunities in the future design and operation of the airport.
- RDA Sydney seeks support from the NSW government following the above workshop, to scope with key industry partners a framework, and the formation of a taskforce with its own implementation strategy to rebuild aircraft maintenance and maintenance training industries by 2020.
- RDA Sydney seeks support from the NSW government and industry partners, to develop Aviation Industry international capability profiles for the NSW-based university and industry research facilities and training of international pilots, administration management staff, engineers and technical service people. Investigate and plan to develop over time a new collaborative university centre of excellence campus with integrated testing and maintenance facilities to provide the *fly-in fly-out* practical on-the-job training for Australian and overseas undergraduates. This would of course include flight training facilities for international pilot training.
- RDA Sydney to recommend to the Australian and NSW government the establishment of a NSW airports-based *Air Freight Efficiency Working Group*, with the Australian Government departments- including Customs, Quarantine groups, Transport agencies; TfNSW, Sydney Airport, Australian Logistics Council, the Australian Federation of international forwarders (AFIF), Export Council of Australia, the Data 61 FLLL Transport Innovation cluster and all of the other key supply chain organisations. This group would look at the effectiveness and efficiency of existing air freight system and processes and make immediate recommendations for streamlining and improving the existing system as well as potential new operations and procedures that could be designed into the new airport.

Section Two - Aerospace and Defence Industries

- RDA Sydney to seek support from the NSW government to investigate and workshop with SADIG, Aviation Aerospace and other key national and NSW industry and government stakeholders, the proposal to develop a virtual collaborative Aerospace/Defence Supply-Chain Cluster including new potential national industry opportunities that could be developed, and the role the Western Sydney Airport would play with the other opportunities for industry development in WSEA.
- RDA Sydney to progress initial discussions with Australian and NSW governments, industry and university research groups regarding a US styled NASA autonomous systems and space hub centre in Sydney including the role the Western Sydney Airport would play and the opportunities for industry development in WSEA. This would include the siting of a new UAV/Autonomous Systems Testing precinct at a site near the new WSA airport.
- RDA Sydney through SADIG would seek to progress with the NSW government, the NSW space capabilities as part of the new Australian government National Space Innovation Policy and Strategies currently being updated. This would include the discussions and objectives of the SADIG Space 2.0 working group in helping develop the strategic direction for the NSW based industry to enhance uptake of A+S2.0 projects - particularly in developing new uses and new technology algorithms, software and process systems which could be implemented using small low-cost cube satellite technology.
- RDA Sydney will continue to work with the Department of Defence DST group and the NSW Chief Scientist's office and DoI to promote the establishment and funding of a NSW Defence Science Institute (like Victoria). This institute would be jointly funded by government, research institutions and industry to accelerate national and international aerospace and research and business opportunities for NSW.

Section Three - Transport and Logistics

- RDA Sydney recommend and seek NSW government support for the formation of a new TfNSW led Freight Working Group. In a similar way to the success resulting from the formation the Port Botany Landside Improvement Strategy (PBLIS), this TfNSW Freight Working Group could work with NSW Ports, the industry bodies, DoPE, ARTC, local councils and the Greater Sydney Commission to form a new Western Sydney T&L freight and supply chain industry taskforce. This taskforce should review the present and future development of the proposed intermodals and those planned in the WSEA at Ropes Creek and at Badgerys Creek in the future and provide advice as to the necessary site requirements, boundaries and offsets, infrastructure, and transport corridors to interface with an efficient airfreight & customs terminal at the new WSA airport.
- RDA Sydney recommend and seek NSW government help and in the development of a new collaborative T&L industry Centre of Excellence precinct at Eastern Creek, which would include a T&L Supply chain management education and research centre. This local centre of excellence precinct would provide a virtual hub of activities for both industry groups and supportive SME technology companies for all of the T&L precincts

in GWS. It could also be linked back to the significant individual research and university transport & logistics knowledge centres already based in Sydney, Newcastle and Wollongong.

- RDA Sydney supports TfNSW led Smart Innovation Centre for Partnership and Collaboration initiative to focus on autonomous vehicles and transport systems based in Huntingwood, Blacktown near WSEA. The TfNSW smart innovation centre would also be an incubator for commercial and academic partners wanting to maximise the potential for their technology innovations. RDA Sydney are happy to participate in initial scoping workshops with respect to the formation.

Section Four - Digital Industries

- RDA Sydney seek NSW government support to help further develop and build a capability profile of the IT technology, warehousing design engineering communications and equipment support companies which are now supporting the growth of the major retailers, wholesaler and distribution companies in GWS.
- RDA Sydney seek NSW government ongoing support to build and develop the WSEA digital industry cluster in GWS as a whole - particularly around the data centres, around smart-ups, smart products and technologies IoT, B2B and Machine 2 Machine real-time automation systems and robotics.
- RDA Sydney recommend to the NSW government to build and expand the newly created collaborative Creative Digital Industry *Pivot* cluster in inner Sydney around UTS to one covering all of Sydney including GWS - based on a *UCSD Connect San Diego* model

Section Five - Advanced Manufacturing & Electronics

- RDA Sydney believe that in order to bring about change it will be imperative that entrepreneurs, designers, engineers and manufacturers become more aware of the skills and technology capabilities available from other entities across Sydney. Individual companies should be encouraged to learn how to better relate to their clients, understand the changing nature of world markets with digital disruption, and how in response, they can collaborate strategically with others, and innovate all elements across their business in their products, processes and management systems.
- RDA Sydney recommend to the NSW government that they should endeavour to create a new *Start-up Ecosystem for Manufacturing* in Sydney, and support industry groups to develop clusters and online capability directories across industry specialties and geographically. RDA Sydney seek NSW government support to help develop a major advanced manufacturing & electronics cluster model for Sydney -based on a *UCSD Connect San Diego* style model. In a similar way to the San Diego region, this could be developed over a range of competitive industry streams covering all of Sydney including GWS. (*See Section 5.3 Best Practice - Connect San Diego*)

- RDA Sydney seek NSW government support to help develop and build industry capability profiles, and a geographic/sector database of the leading manufacturing and research industry sectors. This would include the industry research and technology centres, and companies with leading-edge technologies and expertise.
- RDA Sydney seek NSW government support to help run some *formation* workshops and build an initial *where-to-go website* which would bring together details as to the capabilities, research assistance, and where to go for assistance etc, as well as to create a place where start-up entrepreneurs, venture capitalists and business advisors could be involved.
- RDA Sydney would recommend to the NSW government that they invest in building the necessary international technical and managerial expertise team to bring all this together – investigating and building on the core industry and research competencies that already exist, but more importantly how to build new industry opportunities around data centres; around smart-ups, smart products and technologies; IoT; B2B and Machine 2 Machine real-time automation systems and robotics.

Section Six - Life Sciences, Pharmaceutical Research & Manufacturing

- RDA Sydney to seek meeting with MTP Connect (Medtech and PharmaGrowth Centre), and the Australian and NSW government with respect to supporting a workshop. This proposed workshop, organized in conjunction with Medicines Australia and the Complementary Medicines Australia group, Sydney Airport, the Export Council of Australia, Austrade, the air freight industry and government export agencies, would come together to discuss the issues and further develop the findings in this report. There is a need to develop practical changes that could be implemented immediately to overcome the significant reported lost export opportunities - with respect to new streamlined customs and air transport freight systems, quicker response times, costs and expenses in accessing markets.

Section Seven- Biomedical/Bio tech/ Veterinary Products, Research and Testing

- Further to the above, RDA Sydney would seek to organize with key industry partners a separate workshop with MTP Connect, the Export Council of Australia, AusBiotech and the MTAA NSW Knowledge Hub, Sydney Airport, Austrade and the air freight industry and government agencies, to discuss the issues raised, and to further develop the findings in this report. The objective of the workshop would be to identify practical changes that could be implemented immediately with our airport at KSA, and how we capitalize on this with a new 24/7 WSA airport- with respect to new streamlined customs and air transport freight systems, interim airport specialized refrigeration and storage facilities, quicker response times, costs and expenses in accessing markets.

Section Eight - Agribusiness Research/Food Packaging & Processing

- RDA Sydney to organize with DPI, DoI and FIAL to hold workshop discussions to investigate the development of a new collaborative virtual food innovation research and industry development cluster with specialty streams, which build on the unique industry strengths and all of the key universities research capabilities of USYD, UNSW, UTS and WSU, and the CSIRO in Sydney. Companies interviewed said that there is a need for a combination of high tech, production industries that will complement one another and that see the potential to collaborate and the need for research and innovation.
- RDA Sydney to arrange meeting with WSU, USYD, UNSW and Celestino with respect to the proposed WSU Innovation Corridor. The USYD, WSU and Celestino and Hawkesbury Agripark research facilities could perhaps be leveraged and a newly created sustainable agriculture and food systems degree, as an incubator and feeder initiative for new industry entrants and start-ups.
- RDA Sydney will endeavour to assist the Celestino group, who have planned a future major research Science Park at Luddenham with its own commercial and residential precinct, with the findings of this report. They are seeking to encourage international investment into world class research facilities over a range of industries.
- RDA Sydney seek support from the NSW government to organize a workshop with key industry stakeholders. This workshop would seek to bring together the Export Council of Australia, FIAL, food and agribusiness industry export groups, Australian government agriculture groups, DPI NSW, Sydney Airport and the air freight industry and government agencies, to further develop the findings in this report. It is suggested that one outcome would be to form an export taskforce to develop practical changes that could be implemented immediately with respect to market facilitation and meeting facilities at KSA Sydney airport, new streamlined quarantine, customs and air transport freight and interim refrigeration and storage systems, quicker response times, costs and expenses in accessing markets.

Section Nine - Building and Construction Materials/Resources/Energy

- RDA Sydney seek support from the NSW government to organize a workshop with key sustainable green building and materials industry and research stakeholders to investigate further the interest in developing a smart eco-green building materials and metal specialist industry cluster precinct near Bluescope Steel plant near Erskine Park.
- RDA Sydney seek support from the NSW government to organise a workshop with environmental water, waste and resource recovery management and renewable energy companies and research industry stakeholders to evaluate the potential of encouraging these technology companies to set up manufacturing and technology development in the GWS.

5.3 Best Practice – CONNECT SAN DIEGO

Helping to create and scale great innovation companies through access to the resources that entrepreneurs & growing companies need most – People, Capital, & Technology.

Since 2010, economic development leaders across the world have studied and debated the innovation economy of San Diego. They are trying to quantify the factors that have enabled *CONNECT-San Diego* to become a leading innovation powerhouse over the past 30 years.

In order to support revitalization of the US economy and our global competitiveness, CONNECT has identified a success formula that can be sequenced across other regions of the world.

The key elements in CONNECT's formula for acceleration of innovation are:

- BC : **Business Creation**- Accelerating the success of innovators at all stages of growth
- VC : **Venture Capital** - Connecting innovators to the financial resources necessary for success
- EC : **Educational Curriculum**- Accelerating the learning curve of innovators
- DC : **Innovation Policy**- Representing innovation companies on Capitol Hill and in Sacramento on barriers to commercializing discoveries
- RC : **Recognition & Competition** - Promoting San Diego's ground breaking discoveries and breakthrough innovators
- CC : **Convergence Clusters** - Accelerating innovation with shared information and collaboration

BC: BUSINESS CREATION- Accelerating the success of innovators at all stages of growth

SPRINGBOARD

Hands on mentoring by industry veterans for innovators at the discovery, technology transfer, commercialization, transition and global bridging stages.

ENTREPRENEURS-IN-RESIDENCE

More than 200 entrepreneurs-in-residence and 300 domain experts are available to coach start-ups in business planning, fundraising, financial projections, marketing, engineering and IP.

TECHNOLOGY TRANSFER ROUNDTABLE

Formation of a seed fund loan program to help researchers protect and finance technology innovation development.

CONNECT-ASSIST – Help research institutions recruit and retain key faculty.

SPRINGBOARD GLOBAL BRIDGE - with UC San Diego Extension and is being expanded to take advantage of the potential passage of the Start-up Visa Bill which will enable more entrepreneurs to immigrate to and invest in the US.

LEADERSHIP DINNERS - Moderated, invitation-only discussions featuring leading thought leaders.

VC: VENTURE CAPITAL - Connecting innovators to the financial resources necessary for success

VENTURE ROUNDTABLES- Connecting VCs and angel investors to investment-ready deals in high tech, life sciences, cleantech, convergence (including wireless health), sport innovation, cyber security, autonomous robotics

FINANCIAL FORUM- Education of innovators on all sources of capital and development of new funding models.

TIMELY TOPICS - Education series on new laws, best practices and competitive issues.

DEAL NETWORK - Investment-ready companies present to private gatherings of high net worth investors.

CONNECT/CALIT2 GRANTS PORTAL-The portal, developed in collaboration with Calit2, helps innovators access all federal grants available in their area of focus. Staff support is planned to assist emerging companies with identifying key words and navigation.

LA JOLLA RESEARCH & INNOVATION SUMMIT-Leading scientists provide a vision of the future to out-of-region VCs and institutional investors.

AFFILIATE PROGRAM: SAN DIEGO TECH COAST ANGELS – A Network of individual investors who invest in early –stage deals in Southern California

EC- EDUCATIONAL CURRICULUM- Accelerating the learning curve of innovators.

BIOGEN IDEC ENTREPRENEURS FOR YOUNG INOVATORS PROGRAM

A pilot program funded by a Transformational Grant in Science Education from the Biogen Idec Foundation. The program brings inspiring life sciences entrepreneurs with exciting products into the classrooms of local middle and high schools with the goal of encouraging students to pursue careers in the life sciences. CONNECT plans to extend the program to high tech.

CEO STRATEGY FORUMS - Provides mini YPO®-type experience for growth tech CEOs.

FRAMEWORKS WORKSHOPS- Half-day workshop series on business basics and timely topics.

FRONTIERS IN SCIENCE, TECHNOLOGY & MEDICINE- Lecture series showcases ground breaking research efforts in San Diego.

MIT® ENTERPRISE FORUM- SAN DIEGO - MBA-style case studies and high-level networking.

RC- RECOGNITION & COMPETITION- Promoting San Diego's ground breaking discoveries and breakthrough innovators

CONNECT WITH CONNECT - Network with 600+ business leaders from all of San Diego's technology clusters and see ground breaking displays of new technology.

ENTREPRENEUR HALL OF FAME AWARDS - Honouring San Diego's innovation pioneers.

MOST INNOVATIVE NEW PRODUCT AWARDS - MIP is to San Diego's technology industry what the Academy Awards™ is to the movie business. Ground breaking new products with global impact are honoured. Two extraordinary individuals are recognized with Distinguished Contributions Awards in Life Sciences and Technology and a company that has made a significant impact on society is presented with the William W. Otterson Award.

DC: INNOVATION POLICY- represents innovation companies on Capitol Hill and in Sacramento on barriers to commercializing discoveries.

CONNECT INNOVATION INSTITUTE

The Innovation Institute advocates for federal policies that will create near term jobs and capital investment to stimulate the innovation economy. Priorities include:

- Tax free repatriation of US corporate profits earned abroad and invested in the US;
- Permanent R & D tax credit for external investments;
- Revision of FASB 167;
- Modernization of the SBA loan program;
- Re-introduction of the SBIC as a pre-venture fund; and
- As the pace of innovation accelerates exponentially, ensuring society-at-large has the opportunity to evaluate the ethical impacts of science and technology advances.

WASHINGTON DC OFFICE

DC advocate conducts Innovation 101 Hill Briefings and educates policy makers on the economic benefits of:

- The innovation economy and the impact of regulations on IP;
- Workforce development funding;
- Capital formation;

- Workforce development; and
- Regulation and trade.

CONNECT INNOVATION REPORT

Tracks the health of San Diego's innovation economy in comparison with key innovation regions across the US.

CC: CONVERGENCE CLUSTERS - Accelerating innovation with shared information and collaboration.

NEARSOURCING CLUSTER

Helping companies to stay as virtual as possible as a better way to manage limited capital and increase innovation and speed to market. Initiative includes:

- Integrating a comprehensive online and searchable resource guide into the CONNECT website called TheConnectory.com. It includes 5,000 "nearsourcing" companies in San Diego;
- Networking marketplaces for buyers and sellers; and
- Discussion forums.

IHUB

CONNECT is managing the efforts of 35+ San Diego research and academic institutions, trade associations, regional EDCs and investors to accelerate the growth of San Diego's convergence clusters in mobile health, biofuels, solar energy and energy storage. Outcomes will include:

- New collaborations;
- Employment opportunities;
- Increased access to capital including federal grants; and
- A shorter commercialization process.

SD SPORT INNOVATORS

SD Sport Innovators drives the growth of San Diego's vibrant sports economy by offering innovative programs and services to start-ups, entrepreneurs, mature companies and service providers. Services include connecting the action and sport industry with researchers who have developed new applications in advanced materials and clean technology.

5,000 NEARSOURCING COMPANIES



Connect San Diego Website: www.connect.org

**75+ RESEARCH
INSTITUTES**



**260+ DEFENSE /
TRANSPORTATION**



**600+ BIOMEDICAL /
LIFE SCIENCES**



**3,000+ IT / WIRELESS /
COMMUNICATIONS /
SOFTWARE**



700+ CLEANTECH



**600+ SPORT
INNOVATORS**



**10+ CONVERGENCE
RESEARCH
INSTITUTES**



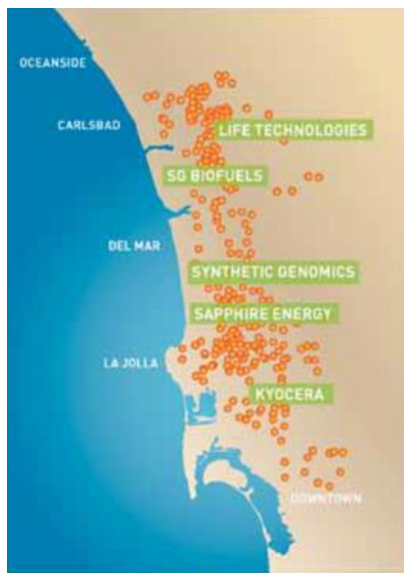
**50+ MOBILE HEALTH &
GENOMICS /
75+ BIOINFORMATICS**



**75+ CYBERSECURITY
& AUTONOMOUS ROBOTICS**



**250+ BIOFUELS /
SOLAR ENERGY &
ENERGY STORAGE**



Section 6 APPENDIX

6.1 Glossary

A+S2.0	Astronautics and Space 2.0
AAUS	Australian Association for Unmanned Systems
ABE	Australian Business Engagement
ACI	Airports Council International
ACSER	Australian Centre for Space Engineering Research
AH	Global Animal Health
ADF	Australia's Defence Force
ARC	Australian Research Council
ARTG	Australian register of Therapeutic Goods
ATFM	Advanced Technologies in Food Manufacturing
B2B	Business to Business
BC	Badgerys Creek
BMEE	Blue Mountains Economic Enterprise
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance
CAS	Centre for Autonomous Systems
CBD	Central Business District
CNNIC	China National Network Information Centre
CMA	Complementary Medicines Australia
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DPI	Department of Primary Industries
DST	Department of Science & Technology
ECA	Export Council of Australia
EIS	Environmental Impact Statement
EOI	Expression of Interest
EU	European Union
FIAL	Food Innovation Australia Ltd
FLLL	Future Logistics Living Laboratory
GDP	Gross Domestic Product
GM	Genetically Modified

GS1	Global Language of Business - standards and services in the value chain e.g. standardized barcodes
GWS	Greater Western Sydney
GWSEDB	Greater Western Sydney Economic Development Board
HVAC	Heating, Ventilation, and Air Conditioning
ICT	Information Communication and Technology
ITLIS	Institute of Transport and Logistics Studies
IoT	Internet of Things
ITTC	Industrial Transformation Training Centre
IP	Intellectual Property
IVD	In-Vitro Diagnostic medical device
JIT	Just In Time
KSA	Kingsford Smith Airport
LGA	Local Government Authority/Area
MRO	Maintenance, Repair and Operations
MTAA	Medical Technology Association of Australia
NASA	National Aeronautics and Space Administration
NIDA	National Institute of Dramatic Art
NSW DoI	NSW Department of Industry
OEM	Original Equipment Manufacturer
PRC	People's Republic of China
RAAF	Royal Australian Air Force
RDA	Regional Development Australia
SADIG	Sydney Aerospace and Defence Interest Group
SASA	Sydney Agriculture Strategic Approaches
SEPP	State Environmental Planning Policy
SMEs	Small and Medium Enterprises
TAFE NSW	Technical and Further Education
TAFE WSI	Western Sydney Institute
TAFE SWSI	South West Sydney Institute
TEU	Twenty Foot Equivalent Unit
TfNSW	Transport for NSW
T & L	Transport and Logistics
<i>TNG</i>	<i>The Next Generation</i>
<i>UCSD</i>	<i>University of California, San Diego</i>

UNSW	University of New South Wales
UAV	Unmanned Aerial Vehicles
UAS	Unmanned Aircraft System
USYD	University of Sydney
UTS	University of Technology Sydney
UoW	University of Wollongong
UoN	University of Newcastle
WSA	Western Sydney Airport
WSEA	Western Sydney Employment Area
WSU	Western Sydney University

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