

Australian agrifood hubs

Industry cluster and precinct approaches



About Future Food Systems

The Future Food Systems Cooperative Research Centre (CRC) is a national initiative created to drive innovation and growth in the agrifood sector by accelerating adoption of STEM technologies and cluster approaches to industry development, resilience and sustainability. It is funded as part of the Australian Government's CRC Program, established to drive industry-led collaborations between researchers and the community to improve the competitiveness, productivity and sustainability of Australian industries, especially in sectors where Australia has a competitive strength.

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Opportunity in the food and agribusiness sector

In Australia, food and agribusiness is a strategic economic sector with strong prospects for future growth. Currently, the sector faces challenges and opportunities including soaring global food demand – and value; improved technological know-how; our reputation as premium food producer; and proximity to Asia’s booming markets. To maximise its potential, Australian agribusiness needs to sustainably boost production efficiency and add value post-farmgate. Developing agrifood industry ‘clusters’, or hubs, will help us achieve this.

Food and agribusiness: a strategic economic sector for Australia

Food and agribusiness is one of six¹ strategic economic sectors identified as important to the future innovation, productivity and competitiveness of the Australian economy ^[1]. A collaboration between industry and the Australian Government identified these sectors on the basis that they ‘...are well positioned to take advantage of emerging opportunities and have strong prospects for future growth’ ^[1]. The Industry Growth Centres Initiative (IGCI), a scheme involving all six of the sectors identified ^[1], is responsible for industry-led and government funded IGCs ^[2]. Food Innovation Australia Limited (FIAL) is the leading food and agribusiness industry organisation, responsible for the delivery of the IGCI across the sector on behalf of the federal government ^[2].

Opportunities and challenges

The challenges and opportunities facing food and agribusiness (hereafter referred to as ‘agribusiness’) have been examined recently by FIAL ^[3] and a number of other organisations, including the Business Council of Australia (BCA) ^[4] and the Commonwealth Science and Innovation Research Organisation (CSIRO) ^[5].

Among their shared conclusions were the following:

By 2050, global demand for food is expected to increase by 77 per cent by value ^[4, p. 9]. This growth is being driven by increased populations, incomes and urbanisation ^[4], predominantly in the Asian region ^[3]. Australia is well placed to benefit from this growth on the basis of our farming and technological know-how; reputation for producing quality food; and proximity to growing Asian markets ^[6]. That said, Australian agribusiness cannot expect to maximise its potential by adopting a ‘business as usual’ attitude ^[5, Schutz p. iii].

1 The other five sectors are: advanced manufacturing; cyber security; medical technologies and pharmaceuticals; mining equipment, technology and services; and oil, gas and energy resources.

Value-adding and innovation

The current model of the Australian agribusiness sector is largely commodity-based – 88 per cent of the nation’s food and beverage output is exported as bulk commodities ^[4, 5]. On this basis, significant scope exists to add value to agribusiness products via increased onshore processing ^[5]. Value-adding opportunities are greatest ‘post-farmgate’ ^[7, p. 14], in the form of innovative processing and products to meet customers’ emerging demands and changing preferences.

Right now, these preferences include food that is healthier, of higher quality, more ‘convenient’ and more provenance-traceable than what has been available traditionally ^[7]. Future consumers will be empowered and motivated to select foods with new and emerging specialised characteristics that complement their lifestyles ^[7].

The CSIRO figure below provides an efficient summary of these consumer trends and subsequent opportunities for growth in the agribusiness sector.

Opportunity Theme		Industry Opportunities
	Products for health and wellbeing Food or beverage products that provide specific health benefits above and beyond basic nutrition, and target consumers who are either health conscious or have specific medical/dietary needs.	<ul style="list-style-type: none">▪ Free-from and natural foods▪ Supplements▪ Fortified and functional▪ Personalised nutrition
	Sustainable solutions Environmentally and socially responsible manufacturing processes and products, and the recovery of novel, value-added products from waste streams.	<ul style="list-style-type: none">▪ Waste conversion▪ Alternative protein sources▪ Sustainable packaging▪ Green and ethical value chains
	Premium interactions Products that fetch a premium price due to quality and convenience, luxury status, novel attributes or their integration with food-based experiences.	<ul style="list-style-type: none">▪ Convenience without compromise▪ Luxury products and gifts▪ Experiences and tourism▪ Novel tastes, smells, textures

Figure 1. Opportunities for growth in Australia’s agribusiness sector. Source: CSIRO ^[5, page vii]

Agrifood hubs – a new direction

These opportunities for Australia’s agribusiness sector are accompanied by a growing community-wide awareness of the need for all industry sectors, including agribusiness, to operate on a sustainable basis ^[6]. Improving agriculture’s sustainability credentials is a fundamental element of continued community support for the sector and ongoing licence to operate ^[6, 8, 9]. On this basis, Hoes *et al.* ^[8, p. 111] explain that it is not a matter of simply upscaling current approaches to production; it is also necessary to pursue ‘alternative directions’. In the context of this research, one alternative direction of value involves co-locating, or ‘clustering’ agribusiness and ancillary/complementary businesses in a given location or region.

Whether this occurs naturally or as a result of policy initiatives, there is a trend, domestically and internationally, for producers and manufactures within a specific sector to group together in clusters ^[10, 11] – the intention of a cluster being to facilitate and accelerate rates of new business development, innovation and productivity ^[10].

For the purposes of this research, such clusters will be referred to hereafter as ‘agrifood hubs’ ^[6, p. 6].

Food and agribusiness clusters (agrifood hubs)

The vision for Australian agrifood hubs is for integrated clusters of co-located firms for sustainable, innovative, high-tech food production, processing, transport and logistics, with efficient transport linkages to key markets helping to streamline supply chains for foods produced in the cluster. These agrifood hubs will be based on sustainable circular-economy and industrial-ecology principles. Their development will be informed by lessons learned from large, well-established regional clusters and peri-urban ‘agroparks’ in nations such as the Netherlands, Denmark and Spain.

The vision underpinning the design and operation of regional and peri-urban agrifood hubs across Australia may be summarised as below:

- Each hub will consist of a cluster of food and agribusiness firms co-located in close proximity. Land uses could include food production, food processing, and transport and logistics activities. Co-location of these businesses within a hub reduces the time and costs associated with longer supply chains and facilitates interaction and networking among proximate firms.
- The clusters may be located in regional, peri-urban or urban areas, with the primary objective behind each chosen location being efficient transport linkages to markets, particularly export market facilities such as seaports or airports. The ‘gold standard’ for delivering a suitable product by airfreight from a farm or processing facility to an overseas retailer is stated as 36 hours ^[6, p. 2]. This feature is particularly important if the facility is intended to produce high-quality (including fresh) food products for overseas markets.
- The food produced within these specialised agrifood hubs will be innovative and tailored to particular subgroups of consumers. Characteristics of the food products may include provenance protection, conveniently packed premium foods, health and wellness foods, products for targeted eating and other personalised foods.
- Each agrifood hub, or cluster, would be designed so as to integrate with and complement its surrounding area.
- Technology and innovation will be major characteristics of these hubs. In terms of food production, the clusters will be synonymous with ‘high-tech farming’. Technology deployed will likely include (but is not limited to) climate-controlled greenhouses; vertical farms and advanced aquaculture facilities, all with an emphasis on automation, information and networks.
- Sustainability credentials will be established by implementing the principles of circular economy and industrial ecology into each cluster’s design. This will encourage arrangements such as waste from one business being used as an input to another, water recycling and co-generation of renewable-energy. Numerous agribusinesses already operate on the principles of circular economy ^[19, 20, 21, 22, 29, 30, 31], and would make valuable additions to specialist agrifood industry clusters.

Acknowledging the Netherlands: agroparks and first principles

Agroparks

In terms of origins of agrifood hubs, the Dutch deliberately conflated the cluster concept, industrial ecology and agriculture to create what they commonly refer to as an ‘agropark’ ^[12-14]. The agropark concept emerged in the 1990s as part of the Dutch response to their own agricultural difficulties, which included over-specialisation, environmental damage and land-use conflict ^[9, 15]. The Netherlands has been, and is, very active in promoting the agropark concept ^[16], with the focus on creating a more productive and sustainable agricultural sector that includes concepts such as industrial ecology ^[13, 15].

First principles

Along with practical experience, the Dutch have developed a strong scholarly tradition of writing about various aspects of agroparks. Researchers who are part of this tradition include Hoes ^[8, p. 115] and Smeets ^[14, p. 17], who provide a summary of what can be referred to as ‘first principles’ for the conception and design of agroparks:

- Agroparks are of a relatively large scale so as to make provision of infrastructure and supply-chain systems viable.
- Agroparks bring together a diverse array of agricultural and industrial activity, with participants connected to each other in a relatively closed system of input and output streams.
- Successful agroparks are dependent on a high degree of collaboration among all stakeholders, at all stages of development.
- Agroparks are not just an agricultural innovation but should also be considered as a systems innovation that recognises the importance of networks and relationships among stakeholders.

Smeets’ 2011 study, ‘Expedition agroparks. Research by design into sustainable development and agriculture in network society’, is an extensive and much-cited source in the agropark literature. On this basis, we consider Smeets’ definition of agroparks to be the most informative:

‘An agropark is a spatial cluster of agro-functions and the related economic activities. Agroparks bring together high productivity vegetable-based and animal-based production and processing along industrial lines combined with the input of high levels of knowledge and technology. The cycles of water, minerals and gases are skilfully closed, and the use of fossil energy is minimised, particularly by the processing of various flows of waste products and by-products. An agropark may therefore be seen as the application of industrial ecology in the agrosector.’ ^[14, p. 17].

Smeets goes on to describe the agropark concept as involving a ‘redefinition of agriculture’ ^[14, p. 62] that involves highly productive agricultural activity being considered as an ‘urban activity’ ^[14, p. 34]. The preference for a near-urban location allows an agropark to access vital services including logistical networks, consumers and sources of knowledge ^[14]. The near-urban preference has also resulted in agroparks being referred to as ‘metropolitan food clusters’ ^{[14][17]}.

Agroparks as a system innovation

As indicated in the list of ‘first principles’ above, agroparks have also been described as system innovations. Geels (as cited in Wubben and Isakhanyan ^[18, p. 146]) defines a system innovation as ‘... a combination of various types of innovations, which create socio-technical transitions from one system to another’. This definition is apt, as agroparks involve changes in producer and policymaker mindsets to recognise new forms of food production. These changes will involve a range of innovations, including firms collaborating and networking, new food production technologies, new locational requirements and coordinated implementation of the principles of industrial ecology.

International cluster case studies

The inclusion of cluster case studies early in this paper is to allow readers a better appreciation of the more theoretical content that follows. The food-industry clusters outlined below epitomise the type and form of activity envisaged for Australian agrifood hubs.

Dutch clusters Foodvalley and Agriport A7 are examples of successful, established agrifood hubs. The emphasis of Foodvalley is on research and collaboration, while Agriport A7 is more concerned with actual food production, logistics and industrial ecology.

Case study: Foodvalley (Netherlands)

As mentioned earlier in this report, the Dutch have been active in the facilitation of ‘agro-clusters’ to improve agribusiness performance and sustainability. An exemplar of this approach is Foodvalley, located in the Wageningen region of the Netherlands. Foodvalley’s focus is on innovation via collaboration between industry, government and researchers. Foodvalley is centred on Wageningen University & Research – regarded as one of the world’s leading agricultural research institutions ^[23].

From the early 1990s there was a desire to connect agrifood companies with researchers and other businesses – this culminated in the formation of Foodvalley in 2004.

Foodvalley describes itself as: ‘... the primary knowledge-intensive agrifood ecosystem in the Netherlands. This ecosystem is characterised by many world class innovative agrifood and food related solutions and by the cooperation between companies, knowledge institutions, education and governments’ ^[24].

The overall aim of Foodvalley is to connect agribusiness companies with industry-relevant knowledge from both the private and public sectors.

Foodvalley is incorporated as a not-for-profit organisation and is financed from company membership fees, the Dutch government and the European Union. Support is provided to members via a number of programs that include training sessions, as well as via networking functions, trade-show participation, innovation advice and use of the Foodvalley logo ^[24].

The Foodvalley community has approximately 175 members ^[24] drawn from agribusiness and knowledge suppliers. Members consist of both large firms and small-to-medium enterprises (SME). Membership benefits both types of firms ^[25]:

- SMEs operating independently may not be able to access various levers of innovation and growth. Foodvalley memberships create benefits in terms of access to knowledge, markets, capital partners and so on.
- Large firms are (potentially) connected to new, innovative start-up companies.

On the basis of its industry-focused research, Foodvalley has become one of the largest agribusiness clusters in the world ^[23, 25]. Much of its success can be attributed to the physical proximity and subsequent interaction of researchers and business ^[11]. Foodvalley benefits from a 'virtuous cycle' ^[25] of research and development that continues to attract more agribusiness firms seeking the benefits of the cluster.

Case study: Agriport A7 (Netherlands)



Figure 2. Aerial view of Agriport A7. Note large greenhouse complexes to the north; business park, including Microsoft data centre, in south-west corner (Source: Google maps)

Agriport A7 is located beside the A7 Motorway, 40 kilometres north of Amsterdam. Largely a private initiative, it was established in 2006 to take advantage of potential synergies between growing, packaging and transporting produce. Since then, it has grown into one the largest and most sophisticated agroparks in the world.

Agriport A7 is sited on reclaimed farming land. Since its establishment, the area of the park has grown to encompass 930 hectares, incorporating:

- open field farming – considered to be an expansion area for future greenhouses;
- 420 hectares of 'high-tech' greenhouses, with the current focus on growing tomato and bell pepper (capsicum) crops; and
- 100 hectares of business park, accommodating logistics and industry, the most notable recent resident being a Microsoft data centre.

In addition to the benefits accrued by co-locating growers, processors and transport, Agriport A7 has incorporated the concept of industrial ecology into much of its infrastructure.

- Its greenhouses recycle their water.
- Given the scale of the greenhouses, they are able to produce their own heat, carbon dioxide (CO₂) and power via 'combined heat and power' (CHP) plants. The heat and CO₂ are used in the greenhouses and any excess power is sold back to the main grid. The park has its own power company to manage this process.
- In 2012, the Agriport A7 power company invested in a geothermal plant to supply additional cost-effective heat to the greenhouses.
- Heat and CO₂ produced by the Microsoft data centre will be used in the greenhouses. Excess electricity produced by the greenhouse's CHP plants will be used by Microsoft.
- In terms of reticulated networks, the park has installed a heat grid, a CO₂ grid, a natural gas grid and its own glass fibre network.

Early issues with the establishment and expansion of the greenhouses included resistance from the local community to allowing intensive livestock production in the park; and community concerns regarding light nuisance, increase traffic and offsite water management.

Sources for this section: ^[23, 26-28].

Agrifood clusters: the Australian context

Agrifood clusters, or hubs, are being developed across regional and peri-urban Australia: in Western Sydney, adjacent to the soon-to-be-built Western Sydney International Airport and across New South Wales, from Moree, Tamworth and Coffs Harbour to the regional city of Parkes; in our national capital, Canberra and the surrounding area; on Queensland's Sunshine Coast; across Victoria's fertile Gippsland region; and in Peel, near Perth, Western Australia. Those planning such clusters must be strategic, giving careful consideration to Australian planning systems, regulations and limits. Place-based and performance-based planning tools can help ensure that proposed and nascent agrifood hubs gain social license.

Despite the agreeable characteristics described earlier in this report, there is a dearth of scholarly research on the theoretical and practical implications of specialist industry clusters or the agrifood hub concept in the Australian context. The cluster and agropark literature to date contains no specific articles referring to Australia. Even in the general, wider-ranging literature – for example, Brenner and Muhlig ^[32] and Porter ^[33] – that includes all types of cluster, including agriculture, scant attention is given to Australia.

That said, there has been some related literature on the relationship between planning and industrial ecology in the context of what are referred to as 'eco-industrial parks' – for examples, see Corder et al. ^[34], Roberts ^[35], Roberts ^[36], and Roberts 2014 ^[37]. This literature is relevant to the industrial ecology component of agrifood hubs. The three most popular case studies in this literature relate to heavy industrial areas: Kalundborg in Denmark, Gladstone in Queensland and Kwinana in Western Australia. Typically, the problem identified in the Australian examples is that the estates are too spatially dispersed to enable the efficient application of industrial ecology principles ^[37].

Thus, going forward, agrifood hubs in the Australian context will be a growing area for research.

The Australian Government Department of Industry, Science, Energy and Resources (DISER) includes a 'Place Based Policy' section that deals with cluster initiatives as part of the government's overall approach to promoting economic growth and development – although DISER refers to clusters as 'innovation precincts'. In terms of agriculturally themed clusters, as part of an introductory interview with cluster specialist Ffowcs-Williams ^[38], some attention is given to equine clusters in the Hunter Valley and to an agriculture cluster around Geraldton in Western Australia. To these you could, for example, add Australia's various wine and sugarcane growing regions.

At a practical level, DISER has produced two publications [39, 40] that give generic guidance with regard to planning and governing an innovation precinct or cluster². For example, the document ‘Planning a new innovation precinct’ [40, p. 2] outlines the following ‘key factors’ for establishing a precinct.

- Start with a base of local strengths.
- Collaborate with local partners to build critical mass.
- Set realistic goals and engage a strong team.
- Set the right level of governance and investment.
- Tap into existing resources and communities of practice.
- Think beyond the local area.
- Create a vibrant ecosystem and a liveable space.

Similar guidance is available in other publications. including Nogales and Webber (2017), *Territorial tools for agro-industry development: A sourcebook*.

Notwithstanding the lack of academic attention to the concept, a number of Australian communities are formulating development initiatives that incorporate cluster principles. These initiatives draw inspiration largely from overseas experience as espoused by various consultancy reports. An introduction to three of these initiatives is provided below.

Western Sydney Airport – Agriculture and Agribusiness Precinct

Sydney’s second airport, the Western Sydney (Nancy-Bird Walton) International Airport, represents a ‘once in a lifetime opportunity’ [41] for complementary business activities to be located in proximity to an international airport. Significantly, agriculture and agribusiness have been identified as appropriate complementary activities. as evidenced by the proposed ‘Agriculture and Agribusiness Precinct’ slated to adjoin the airport’s south-west corner – see *Figure 3* [41].

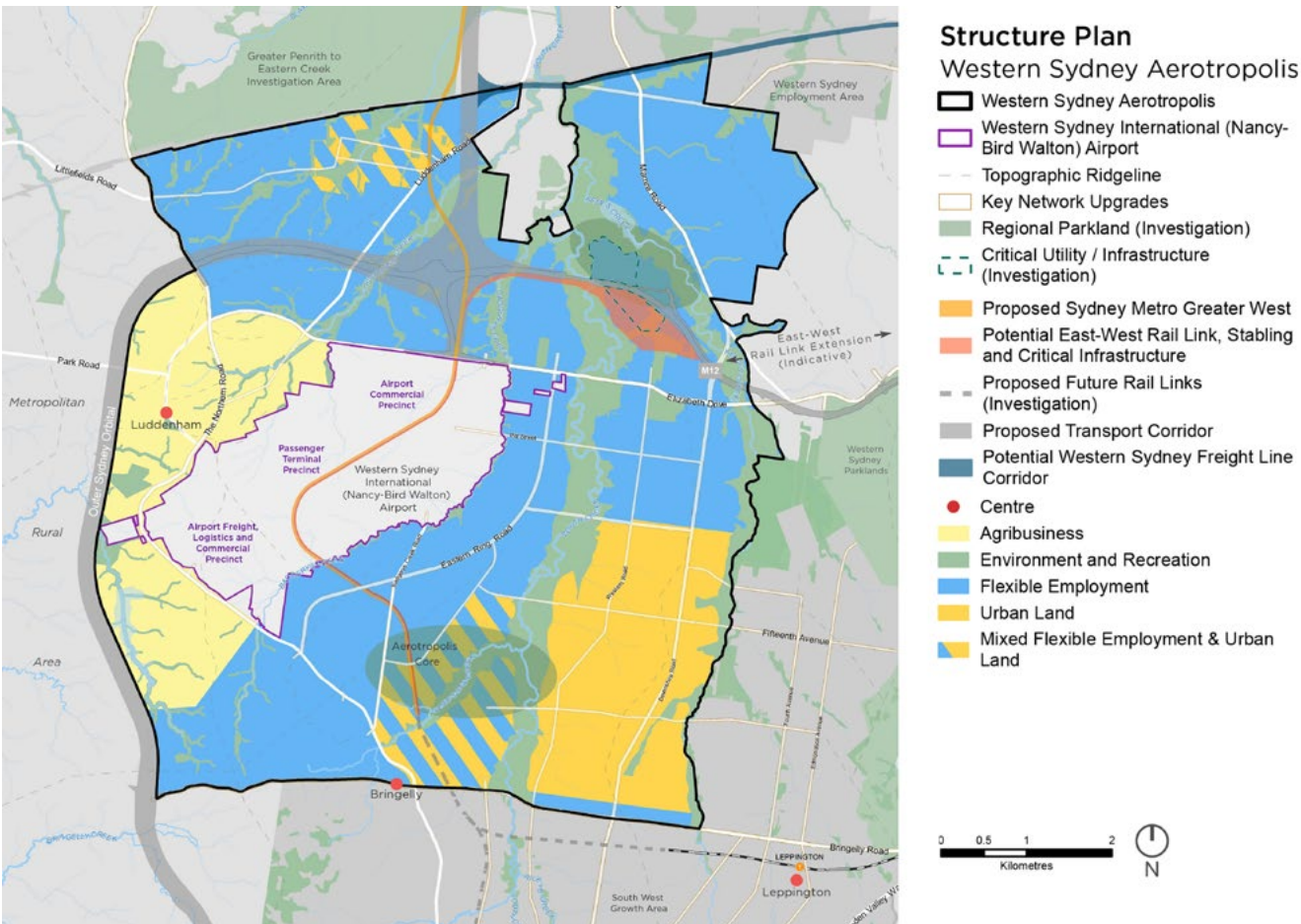


Figure 3. Western Sydney Aerotropolis Structure Plan

² It is not intended to review or repeat the content of these publications as part of this paper.

It is envisaged that the precinct will comprise the following hubs [6, 27, 42]:

- **Integrated Intensive Production Hub:** This hub will support high-value-added, sustainable food production – both in terms of agricultural production and food manufacture, the emphasis being on fresh produce and innovative foods such as customer-tailored pre-prepared foodstuffs; advanced production techniques will include high-tech greenhouses and vertical farming operations;
- **Integrated Logistics Hub:** Access to domestic and international markets will be facilitated by efficient land-side to air-side linkages so that, in terms of international markets, it will be possible for fresh food to be delivered from farm gate to international plate within 36 hours.
- **Food and Pharma Hub:** In addition to fresh food, the precinct will address consumer demand for ‘health and wellness’ foods, nutraceuticals and complementary medicines.
- **Centre of Excellence in Food Innovation:** Innovation will be supported by the provision of an environment that facilitates interaction between industry, academia and government.

Sustainability will be a unifying theme of the precinct. The principles of industrial ecology/circular economy will be integrated into the precinct to address issues such as waste streams, energy use and water conservation.

Food and Fibre Gippsland

Gippsland is a rich agricultural and industrial region located in the eastern part of Victoria. It covers an area of approximately 41,500 square kilometres and encompasses six local government areas. Historically, both agriculture and power generation have been significant sectors in the local economy. However, in response to recent and future power station closures, the local community and local and state governments are developing a number of initiatives, including the application of clustering principles to food production and food manufacturing, to facilitate the transition and encourage economic growth in the region [11, 43].

Food and Fibre Gippsland was formed in 2019 by the amalgamation of two existing bodies: Agribusiness Gippsland and the East Gippsland Food Cluster [44]. This amalgamation was a key initiative in providing leadership for the region’s agribusiness sector [11].

In 2019, Food and Fibre Gippsland [44] commissioned KPMG [11] to prepare a study, ‘Accelerating growth for the Gippsland food and fibre industry’, examining the relative economic strengths of the region as well as strategies for future development. The report identified food and fibre as ‘a priority future industry’ [11, p. 5]. The KPMG report also examines related issues, including innovation and knowledge; supply chains, and improving connections regionally, nationally and globally; and training, career security and advancement.

Proposed actions to accelerate growth in Gippsland’s food and fibre sector are outlined as part of six broad strategies [11]:

- positioning food and fibre as the backbone of Gippsland’s economy;
- transforming food and fibre’s innovation ecosystems;
- developing future industries;
- connecting Gippsland locally, nationally and globally;
- sustainable use of energy, land and water; and
- attracting and cultivating talent and leadership for the industry.

These strategies include a number of policy initiatives to encourage the clustering of firms in the Gippsland region. The initiatives, existing and proposed, are administered by various organisations operating in the region. They include:

- **Latrobe City Food and Manufacturing Precinct.** Eighty-nine hectares of serviced industrial land has been made available at Morwell for this precinct. The site has access to the Princess Highway and is located in proximity to both existing industry and other initiatives; such as the logistics precinct and the ‘Hi Tech Precinct Gippsland’ [11, 45].
- **Hi-Tech Precinct Gippsland.** The precinct is a collaboration between Federation University, TAFE Gippsland, Gippsland Tech School and Latrobe City Council. Its purpose is to bring together education, training, research and industry to support the future development of the region [11, 46].
- **Latrobe City Gippsland Logistics Precinct.** Seventy hectares of serviced industrial land has been made available for an intermodal logistics and freight hub with ready access to the Princess Highway and, via rail (150 kms), to the Port of Melbourne [47].
- **Airports.** The KPMG report raises the possibility of using local airports (Latrobe Regional Airport, West Sale Airport, Traralgon Airport) as interconnected, inter-regional and intermodal freight hubs for appropriate agricultural and manufacture (food) products [11].

Parkes – Special Activation Precinct

Special Activation Precincts (SAP) are a regional development initiative of the NSW Government. SAPs ‘...are a new way of planning and delivering industrial and commercial infrastructure projects in dedicated areas in regional NSW, by bringing together planning and investment support services’ [48]. The Parkes SAP is one of five currently proposed in NSW [49].

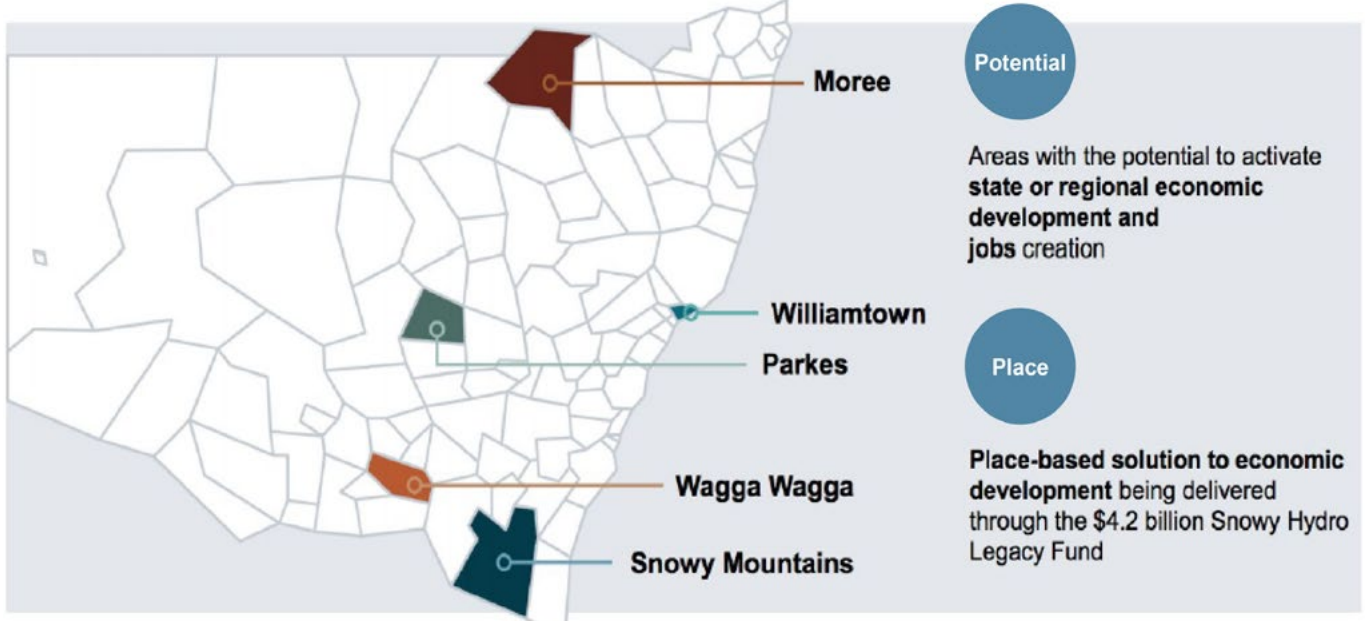


Figure 4. Special Activation Precincts [49]

Implementation of the SAPs is dependent on five key strategies [48]:

- fast-track planning – involving a streamlined planning and environmental approval process;
- infrastructure investment – tailored to meet local needs and including roads, utilities, waste management and digital connectivity;
- government-led studies – to ensure strategic land use and infrastructure planning for the project. This upfront planning takes a burden away from businesses;
- government-led development – to coordinate each precinct’s development in line with the social, economic and environmental requirements for each region; and
- a business concierge service– to target and support suitable businesses and investment.

Planning for the Parkes SAP is well advanced, with the NSW Government recently allocating significant expenditure for infrastructure provision [50]. On this basis, it can be considered somewhat of an exemplar in terms of planning approaches that incorporate clustering initiatives. Figures 5 and 6 [49] provide some insight into suitable and effective planning processes applicable to these types of developments. A major focus of the SAP approach is on ‘delivery’. This involves extensive upfront planning, environmental assessment and infrastructure provision to reduce development cost and complexity for suitable businesses [48, 50]. Typically, this will involve most employment uses being considered as ‘complying’ or ‘exempt development’ [48].



Figure 5. Project delivery [49]

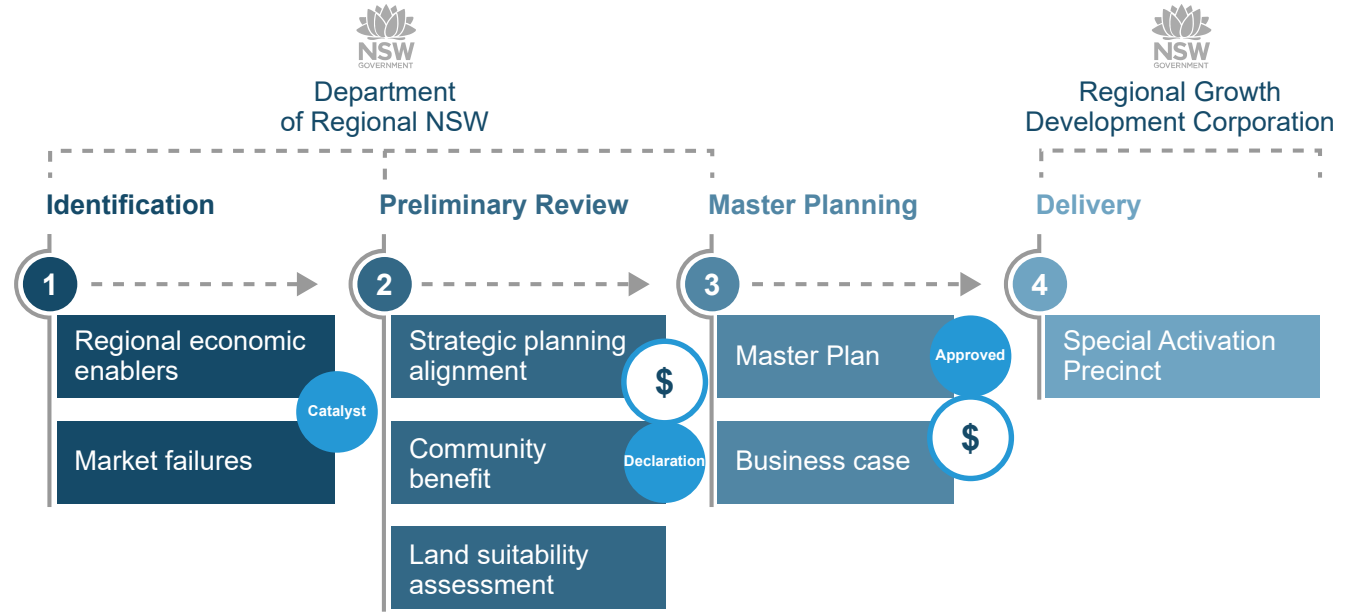


Figure 6. Overall planning process [49]

The Parkes SAP is a 4,800-hectare site located at the only junction of the Trans-Australian Railway and the Brisbane to Melbourne Inland Rail [51]. This strategic location allows rail access to 80 per cent of the Australian population within 12 hours. On this basis, the precinct, building on the existing national logistics hub, has the potential to become Australia’s largest inland port [51, 52].

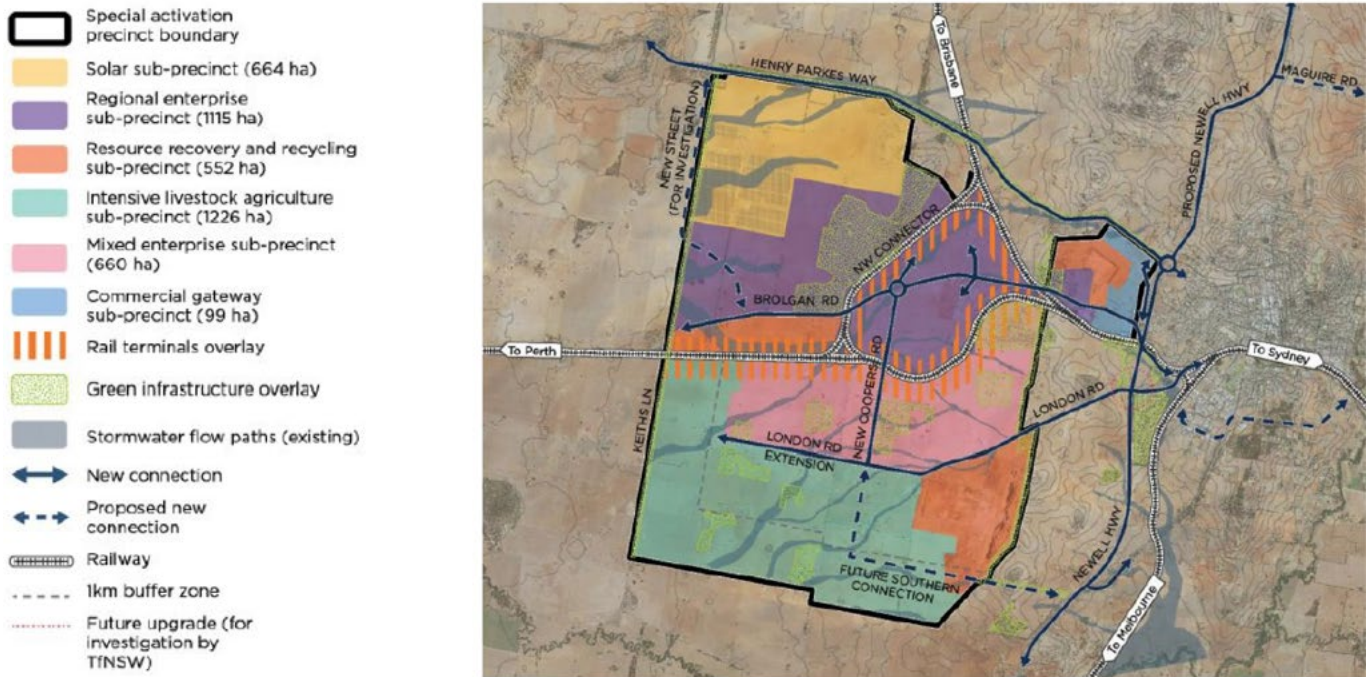


Figure 7. The Parkes Special Activation Precinct Master Plan [49]

As indicated by the master plan (Figure 7), it is intended that the Parkes SAP, as a coherent cluster of complementary activities [53], be available for a wide range of uses. The nature of these uses is set out in detail in the recently adopted ‘Parkes – Special Activation Precinct Master Plan’ [51]. By way of a summary, it is envisaged that the site will have a comparative advantage in three main areas [51]:

- freight and logistics, given the site’s rail and road linkages and the presences of existing logistics businesses, which will include activities such as warehousing and cold storage;
- advanced manufacturing, especially with regard to value-adding and processing of regional agricultural produce; and
- renewable energy and recycling – the SAP includes a solar farm as well as a dedicated recycling and resource-recovery precinct.

Emphasis is also being given to the Parkes SAP’s environmental credentials. It will be Australia’s first ‘Eco Industrial Park’, established in accordance with the United Nations Industrial Development Organisation (UNIDO) framework, which incorporates the principles of circular economy and sustainability into the planning, design and management of industrial estates [51, 54] – refer to Figures 8 and 9 [49].

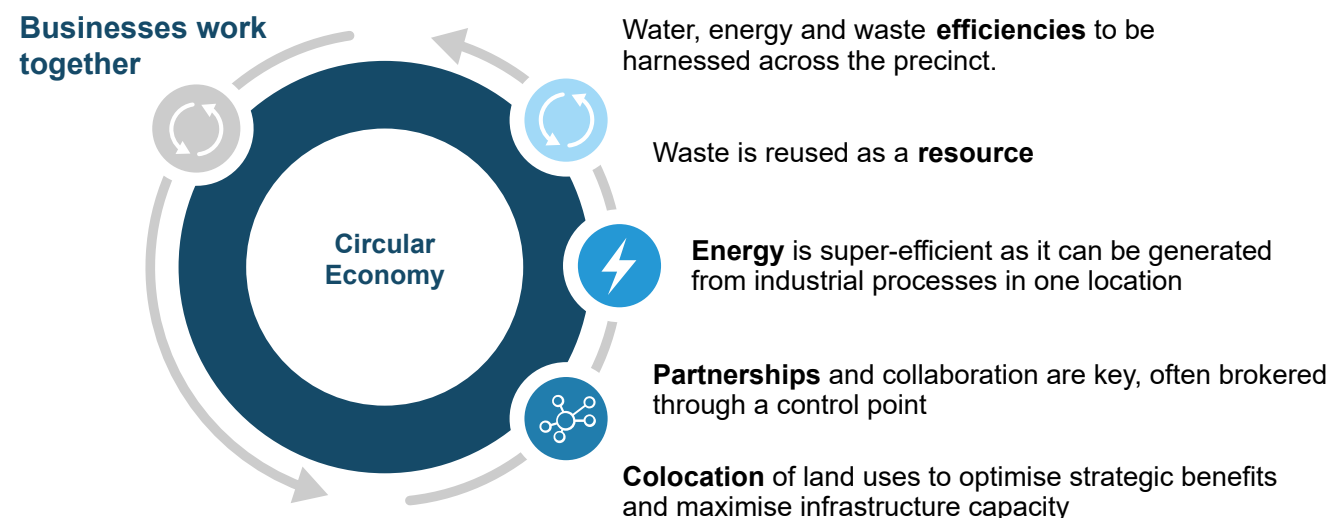


Figure 8. Circular economy principles



Figure 9. Circular economy implementation

UNIDO defines 'Eco Industrial Park' as follows:

'An Eco Industrial Park is a community of businesses located on a common property in which businesses seek to achieve enhanced environmental, economic and social performance through collaboration in managing environmental and resource issues. This is known as industrial symbiosis, which is a means by which companies can gain a competitive advantage through the physical exchange of materials, energy, water and by-products, thereby fostering inclusive and sustainable development.'^[54]

Features that will contribute to the Parkes SAP being classified as an Eco Industrial Park include its solar power precinct, carbon offsets, protection of biodiversity, provision of green space, resource recovery and recycling, and the appropriate provision of infrastructure and utilities^[51].

Transform Peel

'Transform Peel' is a '... 35-year visionary project to create new industries, more jobs and improve food security, through innovation, research and collaboration'^[55].

The Peel region, 75 kilometres south of Perth, has been identified as a high-growth area with development potential in a number of sectors^[55]. The Transform Peel project involves various initiatives including an 'agri-innovation precinct'. Early in the project, the realisation was made that to facilitate the sustainable economic development of the region, a 'business as usual approach'^[56] would be inadequate; that 'things' would need to be done differently^[56] – in a more integrated way.

The Transform Peel project consists of three integrated elements:

- **Peel Business Park:** This is a 1,000-hectare site accommodating precincts for general industry, light industry, renewable energy (an internal microgrid incorporating solar photovoltaic arrays with batteries for power storage) and an agri-innovation precinct. The agri-innovation precinct will house a range of agribusiness activities including food production, warehousing, research and development of food technology solutions, innovation and incubation^[57]. Significantly, the primary purpose of the precinct is to support the emphasis on innovative food production in the associated Peel Food Zone.
- **Peel Food Zone:** The designated Peel Food Zone covers about 42,000 hectares. The aim is for it to be an innovative agribusiness area, with the focus on providing opportunities for year-round production of high-quality produce^[58]. The recent *Peel Agri Food Study*^[56] identified the region as having capacity for a wide range of high-value, intensive rural and food-production activities for both domestic and international markets^[59]. The report also identified the region as being a secure, long-term location for food production and the associated logistics and supply chains^[59].
- **Peel Integrated Water Initiative:** The purpose of the initiative is to address water demand for Peel's business park and food zone. The site is part of the Peel-Harvey Catchment. Of particular significance is ensuring that future water needs are met, and that waste water is dealt with in a way that is environmentally responsible, especially with regard to enhancing '... the ecological value of the area by reducing nutrients levels entering the estuary'^[60].

Government, community support and the overall objective of the Transform Peel scheme have attracted international interest. Fund Singapore Pte Ltd, a major Singapore-based start-up investment firm, has agreed to a cooperative arrangement with the Peel Development Commission and Murdoch University. This tripartite arrangement '... would further strengthen mutually beneficial trade, science and innovation ties between the two countries'^[61]. It gives the Peel project access to additional funding sources and Asian markets and, once the Peel Food Zone is up and running, will contribute to Singaporean food security^[61].

The Australian Planning System – limits and opportunities

As noted earlier, an agropark can be described as a 'systems innovation'^[6]. As with the implementation of any significant innovation, challenges are to be expected. Andrews^[62] notes that the diffusion of innovation takes time, and incrementalism should be expected to be the dominant process while the various stakeholders become familiar with the concept. In addition to this is a planning system involving many different processes in different jurisdictions.

Planning processes are often criticised for being remote, inflexible, inefficient,^[63] overly bureaucratic, uncertain and characterised by out-of-date practices. Typically, the planning system is portrayed in terms of tight planning controls that segregate land uses on the basis of perceived incompatibility^[35, 37]. This is the antithesis of what an agropark, incorporating the concept of industrial ecology, represents. The tension between the extremes (too much versus too little planning) is well recognised by the planning profession (see, for example, Baker *et al.*,^[63]). On a positive note, there seems to be general agreement that planning should allow for flexibility and innovation (Mayere & Donehue, 2013, as cited in Amirinejad *et al.*^[64]), exactly what agroparks require.

Evidence that this is the case is provided by the initial planning documents for the Western Sydney Aerotropolis^[41, p.44], which will accommodate a significant agribusiness precinct – these documents use such terminology as 'A flexible and adaptive planning framework'.

The means for ensuring more flexible, innovative planning has been available for some time – although implementation remains 'patchy', as various stakeholders find it hard to let go of the 'old ways'.

Strategic planning

Roberts^[35] calls for planning schemes to recognise clusters, mixed uses and concepts such as industrial ecology, including the requirement for waste-sharing. Support for these concepts should be clearly communicated and set out in the planning scheme^[62, 65].

Most planning schemes include a strategic plan that sets out the future intentions for an area. This is the appropriate document in which to include provisions supporting clustering and industrial ecology as part of the scheme's strategic objectives. These objectives will influence the determination of subsequent development applications.

Place-based planning: dealing with complexity

Earlier in this report, we introduced the agropark, otherwise referred to as an agrifood hub or cluster, as a system innovation: a new way of organising and conducting business. In its most developed form – for example, with different firms coordinating, sharing waste streams and implementing the principles of circular economy – an agrifood hub may be considered a relatively complex undertaking. Such complexity can best be addressed via a place-based planning (PBP) approach ^[66].

Although the concept of PBP is not particularly new ^[67], it is increasingly recognised as an effective method of implementing government programs ^[68, 69], including urban and regional planning. As an urban and regional planning example, consider the Greater Sydney Commission, which has been explicit in its recognition and utilisation of PBP ^[66, 70] as part of its various planning strategies.

The section below contains two descriptions of PBP: the first is drawn from ‘*The Greater Sydney Region Plan – A Metropolis of Three Cities*’ ^[70]; the second from the Queensland Government Department of Communities, Disability Services and Seniors ^[68]. Both descriptions introduce the importance of concepts such as collaboration, building relationships, local experience, stakeholder inclusion and shared visions.

From ‘*The Greater Sydney Region Plan – A Metropolis of Three Cities*’ ^[70, p. 76]:

“Place-based planning is a design-led and collaborative way of examining the complexity of the city by viewing it as a mosaic of different places, each with unique potential and characteristics. It is a means of better understanding a place, and building relationships and collaboration to deliver a vision and solutions that respond to a place’s potential.

‘Focusing on how specific places work and collaborative processes that recognise the value and need for local expertise, knowledge, responsibility and investment allows the development of a shared vision and values.

‘People involved in the process vary depending on the circumstances, nature and scale of the task and may include the community, local businesses, residents, [s]tate and local governments and other stakeholders. A shared vision for a place that resolves different perspectives and interests can then be created.

‘The shared vision and a spatial framework for a place provide the basis for future development, governance and allocation of responsibilities. The outputs of place-based planning detail how the vision will be implemented and the place activated, monitored and managed. Place-based planning is also a way of managing change over time through staging, sequencing and re-visioning that allows for continual adjustments and improvements.

‘A place-based approach can be applied to streets, neighbourhoods, local centres and larger scale urban renewal. The approach also underpins the development strategies in Collaboration Areas.’

And from the Queensland Government Department of Communities, Disability Services and Seniors ^[68]:

‘Place-based approaches join up the efforts of all community stakeholders (citizens, industry, diverse non-government organisations and all levels of government) to improve the social, economic and physical wellbeing of a defined geographical location. These approaches are highly collaborative, take time and are ideally characterised by partnering and shared design, shared stewardship, and shared accountability for outcomes and impacts. Place-based approaches are often used to respond to complex, interrelated or challenging issues such as social and economic disadvantage, natural disasters or environmental problems.’

In a recent presentation, Simpson, a Commissioner from the Greater Sydney Commission, succinctly described PBP thus: “It’s about collaboration, coordination and integration – in other words, bringing multiple parties together to focus on a place.” ^[66, p. 1].

PBP has emerged as a response to the tendency for reductionist ^[71] government policy in terms of design and delivery. Traditionally, government departments are organised on a narrow sectoral basis – a situation that is reflected in service and infrastructure delivery. Operating on the basis of these policy ‘silos’ ^[71, 72] often resulted in policy gaps ^[71] and unintended consequences ^[72] as policy delivery was based on the requirements of individual agencies as opposed to those of their communities. PBP represents a more holistic approach, emphasising place-based rather than sectoral outcomes ^[71, 72].

Performance-based planning

Performance-based planning (PBP) removes emphasis from the *label* of the use and assumptions about its impact to the actual intensity, functions and characteristics of the use ^[63]. Potential development is assessed against predetermined standards of actual performance rather than simply being ‘allowed’ or ‘prohibited’ in a given zone. Overall, PBP allows for the integration of land uses based on assessment of actual impacts ^[63]. For example, with respect to agroparks, greenhouses, food processors, universities, biomass generators and warehouses could all be integrated provided that performance standards could be met.

Agrifood hubs: theoretical basis

Organisations join clusters to benefit from ‘cluster effects’ including greater productivity, innovation and returns. Geographically concentrated and interconnected, clusters are agglomeration economies in which cost reductions, productivity and sustainability gains are made via ‘economies of scale’ in transport, labour, energy etc. Social networks facilitate clusters’ success, fostering business environments characterised by trust, knowledge-sharing and calculated risk-taking. The ‘positive growth spiral’ experienced by well-sited clusters often impacts surrounding economies, accelerating regional growth.

On the basis of Smeets’ definition, it follows that firms locating in a cluster will be looking to take advantage of various ‘cluster effects’ ^[12, p. 519].

Putting agrifood hubs as a specific cluster type aside, temporarily, the general literature on clusters is extensive (for example, see Enright ^[73]; Gordan & McCann ^[74]; Martin & Sunley ^[75]; Porter ^[76, 77]; Wolman & Hincapie ^[78]). It appears that the main reasons for this ongoing interest in clusters are:

- their policy potential for improving firms’ productivity, as vehicles of innovation ^[33, 79, 80];
- their contribution to local, regional, and national economic growth ^[75, 78]; and
- their role in improving sustainability ^[17].

Clusters

Despite the extensive literature describing, theorising and analysing clusters, there is no widely agreed concise definition of a cluster. Martin and Sunley ^[75] discuss the elasticity of the concept as both problematic and an advantage. Problematic as the concept has become ‘chaotic’, with too many variations and connotations. Conversely, the elasticity of the concept can be seen as an advantage, as it allows for its wide application.

Lack of an agreed definition encourages many authors to devise their own, most likely in accordance with their own perspectives or requirements. Martin and Sunley ^[75, p. 12], for example, list 10 definitions under the heading ‘Clusters: the confusion of definitions’. As a prolific and widely cited thinker and writer on clusters, Michael E. Porter ^[33, 76] is as reasonable source as any for a suitable introductory definition:

‘Clusters are geographic concentrations of interconnected companies, specialised suppliers, service providers, firms in related industries, and associated institutions (e.g., universities, standards agencies, trade associations) in a particular field that compete but also cooperate.’ ^[76, p. 16]

This definition includes several key characteristics of clusters, including geographic concentrations, involving proximity; and interconnectedness and cooperation, involving networks. These characteristics serve to partly introduce the theoretical basis of clusters, being agglomeration economies and social networks.

Agglomeration economies

Drawing from the regional economics literature, agglomeration economies have been described specifically as the ‘cost reductions [or productivity gains] that occur because economic activities are located in one place’ (McDonald & McMillen, 2007, p. 36, as cited in Cohen et al. ^[81]). What are the nature of these cost reductions and/or productivity gains? Agglomeration economics owes its origin to the field of neo-classical economics ^[74, 81] which, in terms of a firm, emphasises tangible cost reductions, typically with regard to transport costs, labour costs and achieving economies of scale. Typically, cost reductions should result in productivity gains.

Transport costs

Transport costs, for both raw materials and finished product, are a significant consideration in the location of a firm. Depending on the characteristics of the product (e.g., bulk, perishable), firms will either locate close to the raw material or close to the market so as to minimise transport costs ^[82]. Further, concentration of related firms in a cluster typically results in shorter supply chains, thus saving costs.

Labour costs

Labour will start to congregate in proximity to agglomerations, due to the available opportunities ^[82]. A large labour supply allows firms to expand or replace labour efficiently – thus reducing costs and improving productivity. Agglomeration also provides labour with more opportunities and alternatives in the job market. Ultimately, these ‘job matching’ opportunities reduce costs and risk for both firms and labour ^[74, 81]. Furthermore, and as an appropriate lead-in to a discussion on social networks, it is the case that the circulation of workers – i.e., internal migration between firms – is a major source of knowledge spillovers ^[74, 78, 81].

External economies of scale

Porter ^[33] describes a situation in which traditional, internally vertically integrated firms may become inefficient in the newer, more dynamic economic environment. Although not stated, typically this dynamic environment includes such things as new technology, changing consumer preferences, increased competition and so on.

As the number of sector-related firms in the agglomeration grow, so does the opportunity for outsourcing. Outsourcing refers to activities previously carried out internally (such as accounting, general maintenance, component manufacture) now being given to another, typically specialised firm that can provide the service more efficiently and responsively ^[33]. The assumption is that the supplier firm, by supplying a number of other firms, is operating at its most efficient scale of production ^[81]. The supplier firm is thus achieving economies of scale as a direct result of its external networks.

This growing emphasis on external economies has, according to Porter ^[33], changed the emphasis from what happens inside the firm to what happens outside the firm. Subsequently, there is a greater emphasis on relationships and networks.

Clusters and regional growth

Writing from a regional economics perspective, Capello ^[83] explains the location a firm selects is one of the critical factors in determining its productive capacity. Firms are attracted to clusters to avail themselves of the various beneficial cluster effects ^[12, 78]. The literature almost exclusively attributes these beneficial effects to the existence and operation of agglomeration economies and social networks ^[33, 74, 75, 78, 84]. These benefits are produced by the aggregate of activity within the cluster. Similarly, Wolman and Hincapie describe the situation as involving the creation of ‘benefits external to the firm as opposed to arrangements initiated and organi[s]ed by an individual firm’ ^[78, p. 137]. Seeking these benefits is the reason firms typically locate in proximity to one another, in a cluster.

Ultimately, a firm's goal in joining a cluster is to improve its productivity. In turn, increased productivity leads to improvements in other business performance indicators including income, employment, investment and innovation. Improvement in these indicators leads to further increases in productivity and so on. Cluster-wide, the increased productivity of firms encourages further innovations and attracts new firms, all of which continues the growth and development of the cluster. Ingley ^[85] refers to this self-fulfilling process as ‘the positive growth spiral’. Enhanced performance of firms in the cluster, along with the cluster’s aggregate growth, also contribute to the growth of surrounding local and regional economies ^[81, 83]. That this is the case makes the cluster concept particularly attractive to various levels of policymaker.

Social networks

The preceding discussion on agglomeration economies establishes the economic credentials of clusters. But are agglomeration economies the whole explanation? What transforms a group of proximate firms from an agglomeration into a cluster?

After their own examination of agglomeration economies, Wolman and Hincapie ^[78, p. 136] pose a similar question: ‘But are clusters more than that?’. At this point they, along with various other authors (Gordon & McCann ^[74]; Martin & Sunley ^[75]; Li ^[86]), introduce the concept of social networks and their role in the establishment and growth of clusters.

A social network can be defined as ‘a network of social interactions and personal relationships’ ^[87], and is considered to be a form of ‘durable social capital’ ^[74, p. 520]. Social capital is important to the functioning of any system that involves human interaction, including the economy. This statement is supported by the following definition from the World Bank:

‘Social capital refers to the institutions, relationships and norms that shape the quality and quantity of a society’s interactions. Increasing evidence shows that social cohesion is critical for societies to prosper economically and for development to be sustainable. Social capital is not just the sum of institutions which underpin a society – it is the glue that holds them together.’(World Bank, 1999, as cited in Woolcock et al. ^[88, p. 15])

Providing commentary to this definition, Buffini and Cuers add that social capital includes ‘...formal and informal networks that enable people to mobilise resources and achieve common goals ...’ ^[89, p. 1].

Interest in social capital as a concept, and its utility, is most often attributed to the writings of Robert Putnam, including his seminal work *Bowling Alone* (2000). In terms of the relevance of social capital to this research, Putnam assists with the following explanation:

‘For a variety of reasons, life is easier in a community blessed with a substantial stock of social capital. In the first place, networks of civic engagement foster sturdy norms of generali[s]ed reciprocity and encourage the emergence of social trust. Such networks facilitate coordination and communication, amplify reputations, and thus allow dilemmas of collective action to be resolved. When economic and political negotiation is embedded in dense networks of social interaction, incentives for opportunism are reduced.’ ^[90, p. 67]

Enright ^[73] and Gordon and McCann ^[74] discuss the development and maintenance of social networks as attributable to a wide range of factors, including a local and collective identity, shared norms, shared resources, a common history, a sense of common interest (community cohesiveness), repeated interactions, interdependencies, proximity, opportunities for personal contact, expectations of significant gains and so on.

These shared norms and common interests are also referred to as ‘non-traded inputs’ ^[74, p. 516] and as ‘untraded interdependencies’ ^[65, p. 1317-1318]. ‘Development and maintenance of these networks creates a business environment characterised by trust, increased opportunities to share knowledge via knowledge spillovers as well as a greater propensity for taking risks.’ ^[73, 74, 91] Networks and social relationships also give firms greater access to resources and information ^[33]. Ultimately, these characteristics increase the productivity of both firms and the cluster as a whole. This environment of cooperation, learning and increased productivity within clusters has been described as ‘local buzz and local milieu’ ^[91], ‘magic fuel’ ^[17], and ‘social glue’ ^[33].

The how-to of social networks

Although the literature places much emphasis on social networks and their role in cluster development, limited explanation is available on how these networks form, or can be encouraged to form. Porter ^[33, p. 109] notes that the process is ‘far from automatic’. Unfortunately, use of terms such as ‘local buzz’ and ‘social glue’ offer limited guidance.

Taking a rational perspective on the issue, Deutz and Gibbs ^[65, p. 1317] note that personal contacts can be either ‘institutionally mediated’ or ‘purely social’. In terms of the social, Saxenian ^[92] makes much of the role of social gatherings at places such as local clubs and local restaurants in shaping the local culture. This social and personal contact presumably initiates the creation of formal and informal networks.

In terms of institutions, notwithstanding the widespread use of the term, little attempt is made to define them. Recognising the situation, Bathelt and Glucker ^[93, p. 340] (2014) describe this vagueness as ‘...a “black box” to relate otherwise unexplained influences on economic development’. Porter ^[33] and Saxenian ^[92] include many activities and organisations, both public and private, under the ‘institutional’ heading: regulatory bodies, public utilities, universities, standards associations, trade and professional associations, financial services, think tanks, and public and private investment in infrastructure. This long list is evidence of the many possible institutional arrangements that could be applied. Saxenian adds clarity to the issue by describing institutions as ‘...forums that create and sustain regular patterns of social interaction...’ ^[92, p. 7]. Institutions are part of the cluster’s relationship-building mechanism ^[33].

A potential social network – an anecdote

Anecdotally, the role of social networks has been confirmed, during a meeting in October 2019 regarding the proposed agribusiness precinct associated with the soon-to-be-built Western Sydney International (Lady Bird-Walton) Airport ^[94]. Attendees included a range of food and agriculture-related stakeholders, among which there was much familiarity, and all were all keen to see the project proceed. Borrowing a term, there was quite a ‘buzz’ at the meeting – the expectation being that this will form a solid basis for a cluster-specific social network.

Clusters and sustainability

From their inception, a distinguishing characteristic of agroparks has been an emphasis on their contribution to sustainability in the agribusiness sector (see Pages 4 & 5 of this report and Gerritsen et al. ^[17], Smeets ^[14]). Coenen et al. ^[79, p. 483] include sustainability as one of the ‘grand challenges’ facing society. Being specific to ‘food clusters’, Gerritsen et al. ^[17, p. 1] describe sustainability not only as an accompanying goal – along with competitiveness and wealth creation – ‘but a core mission driving territorial initiatives such as cluster developments’. The enthusiasm for sustainability continues and includes the suggestion of a new term, ‘sustainability cluster’ ^[17, p. 4].

The characteristics of a cluster allow it to contribute to sustainability in the following ways – via:

- the co-location of producers, processors and logistics firms reduces the issues associated with indicators such as ‘food miles’;
- the techniques implemented by individual firms – for example, ‘high-tech’ vertical farming or onshore aquaculture; and
- as demonstrated by the case of Agriport A7, the opportunity for firms to utilise each other’s by-products or waste streams, this being consistent with the concept of industrial ecology.

Industrial ecology

Agroparks are complex entities based on networks between geographically proximate, heterogeneous organisations ^[16]. Applying the principles of industrial ecology to a cluster adds to the complexity.

‘Industrial ecology’ – a concept akin to ‘circular economy’ – is an established scientific discipline that combines ecology, the engineering sciences and economics ^[95]. Growth in awareness of the concept is attributed to the seminal article by Frosch and Gallopoulos, which began with the simple statement, ‘Waste from one industrial process can serve as the raw materials for another, thereby reducing the impact of industry on the environment’ ^[96, p. 1]. Industrial ecology has subsequently become a prominent concept in both the general literature on ‘eco-industrial development’ ^[37, 65] and in the specific literature on agroparks ^[14, 16, 97].

Roberts describes the overall goal of industrial ecology as being to ‘close the loop on energy loss and waste’ ^[37, p. 159] that is typical of the current linear industrial system. The current production mode involves extraction – production – consumption – disposal ^[37]. Gallaud and Laperche ^[95] similarly refer to the modes as take – make – dispose. A transition to a more circular system that redirects [previously considered] waste and by-products back through the production process for reuse, repair or recycling represents a significant change to established dominant production processes ^[35].

Industrial ecology is most efficient, in terms of establishment and operating costs, where there is a clustering of firms ^[35]. It is also necessary to select or encourage firms to locate in the cluster based on their ability to participate in its waste exchange system.

If a cluster is to proceed in accordance with the principles of industrial ecology, high degrees of innovation and cooperation will be required. A high level of interdependency will enhance environmental performance ^[16]. This, in turn, highlights the importance of social networks ^[65].

Cluster paradoxes

Location matters

Conventional understanding of ‘the global economy’ involves firms chasing the lowest input costs to maintain productivity. This has traditionally seen firms move activities offshore to developing nations with cheaper costs; however, such a strategy is generally available to all firms, to some extent negating any competitive advantage firms adopting this strategy may have hoped for.

Notwithstanding this trend, clusters in developed countries remain and continue to thrive. Morosini ^[84] and Porter ^[33] address this paradox directly, explaining that cheaper-cost locations can’t match a successful cluster in terms of its access to highly specialised skills, special relationships [networks] and quality institutions, all of which combine to drive both innovation and productivity. Similarly, Butler and Mandeville ^[82] describe the situation where the limited advantages of developing economies (such as relatively cheap labour) are not sufficient to offset the advantages of agglomeration. Morosini describes the situation eloquently:

‘...global logistics means that basic production factors such as capital and nonspecialised labour are largely open to all, whereas flows of specialise[d] knowledge and rich knowledge interactions that lead to valuable innovations remain stronger between agents in the same spatial group...’ ^[84, p. 307].

Adopting a different perspective, Ingley ^[85] highlights the importance of cluster networks to small and medium sized firms. Specifically, networking potentially allows them to achieve more collectively than they would individually. This improves local productivity, thus the allowing the cluster to continue, notwithstanding globalisation.

Simultaneous competition and cooperation

Although the positive relationship between competition and cooperation has been described as paradoxical ^[73, 92], it is essential to long-term cluster viability. A quote from Saxenian’s study of Silicon Valley effectively describes the situation: ‘The paradox of Silicon Valley was that competition demanded continuous innovation, which in turn required cooperation between firms.’ ^[92, p. 46]

Cooperation is an important part of doing business with suppliers and buyers [vertical relationships]. Suppliers and buyers are part of the iterative ^[73] feedback and information-sharing process that, potentially, improves the innovation and productivity of a firm and of the cluster as a whole. Cooperation also occurs between competitors [horizontal relationships]. This cooperation is most visible in terms of activities such as joint infrastructure, environmental management, common marketing, lobbying and so on. These activities all contribute to the effective operation of the cluster. Ultimately, the firm considers the trade-off between its independence and the potential benefits of the cluster’s communal resources ^[73].

In terms of competition, following the quote above, Saxenian ^[92] describes a situation in which firms, although fiercely competitive, still collaborated, and in which information on innovation was distributed seamlessly through local social and professional networks. It was these practices and arrangements that distinguished the region.

Porter ^[33] considers local rivalry as an essential component of increased innovation and productivity. Firms that are part of a cluster are able to observe competitors ^[73] as well as obtain information from various networks within it. This constant comparison and peer pressure provide an impetus for ongoing innovation.

Cautionary issues

Risk

Porter ^[33] describes a situation in which the collective nature of a cluster, involving relationships with numerous suppliers and customers, and the trust associated with social networks, actually reduces uncertainty and risk. Further, this networked environment supports firms to undertake risky activity ^[74]. This said, traditional agriculture is an inherently risky sector. The production of food is subject to many uncertainties, including variable weather and climate, seasonality of production, product perishability and price fluctuations ^[98]. One of the original motivations behind the development of agroparks was to address these issues of uncertainty and risk via the concepts associated with clusters and industrial ecology.

The extensive experience of the Dutch with the agropark concept includes reflection on these precincts’ performance. Notwithstanding some apparent successes (such as that of Agriport A7), implementation overall has lagged or has been problematic ^[12, 13, 99]. Hoes and Regeer ^[13] describe agroparks as a ‘systems innovation’ that involves significant complexities when compared to established systems. This complexity and ‘newness’ ^[100] lead to uncertainty that, in turn, reduces the likelihood of adoption ^[13].

Based on several case studies, Ge *et al.* ^[101] identified various risk factors applicable to agroparks:

- social or legal resistance to the development of the agropark;
- the economic or environmental impact elsewhere;
- technological problems in implementing the concept;
- the level in which stakeholders share the value propositions of the agropark and agree to cooperate under these propositions; and
- the level at which participating enterprises are prepared to abide by cooperation agreements when these become unfavourable due to changes in market conditions.

It was generally concluded that a lack of appropriate institutional arrangements contributed to these risks ^[101].

Drawing on a number of sources, Nogales and Isahakyan ^[102] outline the key elements that contribute to a functional institutional design for an agropark.

- Set clear and realistic goals.
- Ensure any rules or legal framework are clear and predictable.
- Ensure transparency, equity and inclusiveness.
- Facilitate participation and consensus-building, especially at critical stages of development.
- Develop a responsive system by which to deal with issues.
- Depending on the circumstances, expect to start small and encourage development to occur incrementally.

Fundamental cluster concerns

Everyday planning issues

Notwithstanding the numerous benefits of clusters, it is necessary to be aware of potential problematic issues. As a concentrated land-use pattern, clusters may be subject to everyday planning issues such as congestion and pollution. A successful cluster may also experience inflationary pressure with regard to land and labour costs ^[75].

Market extremes

Porter ^[33] is an avid supporter of allowing the markets a fairly free rein with regard to clusters. Unchecked, and in extreme cases, this could as result in local cartels ^[33]. These cartels could limit access to the cluster, with a corresponding impact on competition, innovation and productivity. These impacts could threaten the longer-term viability of the cluster.

Other researchers have detailed similar concerns in terms of the implications of highly embedded firms and networks. Such firms may become less responsive to economic and social signals from both within and outside the cluster, which may ultimately retard both firm and cluster growth ^[75, 78].

Cluster emergence

Of particular interest, and possible concern, is the view expressed by some researchers that clusters shouldn't be created *de novo* (i.e., from the beginning or 'from new') ^[65, 75]. Porter supports this: in his view, clusters should be supported where locational advantage already exists and the '...seeds of a cluster have already passed a market test' ^[33, p. 122].

Such a view may be at odds with cluster aspirations of both policymakers and communities. However, the situation is not clear either way. For example, Agrolgy Pty Ltd ^[23] credits the success of Agriport A7 to the fact it was started from nothing – although it is noted that it was part of an agricultural area.

Detailed examination of this issue, although beyond the scope of this paper, is considered important further research.

Transnational policy diffusion

Like most other commodities, various land-use policies and practices have been subsumed by globalisation processes and, as a consequence, planning ideas have been travelling between nations. This situation applies to agrifood hubs.

A number of scholars have considered this matter, using terminology such as 'circulating urban knowledge' ^[103], the 'transnational flow of ideas/knowledge' ^[104, 105] and 'cross-border mythologies' ^[106]. It is a standard approach of policymakers to seek out 'best practice' to address an issue; often, this involves looking at existing practices in other countries.

That said, it is important to be cognisant of the original context from which the policy emerged, as this will likely be different to the new context – the implication being that the imported policy may be incomplete and/or unpredictable ^[103] in its new setting. On this basis, it is important to examine such transfers critically, taking into account the local nuances ^[103, 104] of both the policy's origin and its destination. Lieto ^[106] and Tait and Jensen ^[107] generally conclude that such an approach will likely result in a hybrid version of the original. How will Australian agrifood hubs compare to Dutch agroparks?

Conclusion

Agrifood hubs are a type of specialised industry cluster. In addition to economic basis, it is essential to recognise that a cluster is not just a collection of co-located firms. A cluster is a community in which both economic and social entities work together, connected by networks ^[84], to produce innovation, economic growth and environmental benefit.

This paper has examined the various theoretical and practical implications of clusters. Most of the literature relied on is drawn from overseas sources. Limited research is available on agrifood hubs in the Australian context. Going forward, this will be an important area for additional research.

Further information

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