Hunting Clusters – Mapping Regional Industry Concentrations for Industry Development

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ABSTRACT

This paper outlines the process of cluster mapping within the Eastern Metropolitan Region (EMR) of Perth using industry data provided by Sensis Pty Ltd, and employment data from the Australian Bureau of Statistics. Through a research alliance with the University of Western Australia's Graduate School of Management, data from Sensis' new Yellow Pages® Business Activity Reporting service was used to assist in the identification of industry clusters within the EMR. ANZSIC (Australia and New Zealand Standard Industry Codes) were used to calculate location quotients to identify employment and business concentrations within specific industry categories that were significantly higher than within the metropolitan, state or national average. These findings were then used to identify potential clusters as the first stage of a longer-term cluster development project. Three potential clusters were identified: 1) a transportation, machinery and logistics cluster; 2) a building materials cluster; and 3) an agribusiness food-wine cluster. The methodology used and their future applications to other regional clustering initiatives are outlined.

INDUSTRY CLUSTERING FOR ECONOMIC DEVELOPMENT

Industry clustering is a concept that has become well established within economic development literature since at least the 1980s (Anderson 1987). It has been used as a framework for assisting the creation of new enterprises, as well as enhancing the sustainability of established ones (Surridge, Dewit-Martin, & Kilko 1997; Porter 2000).

Paper presented at the Small Enterprise Association of Australia and New Zealand (SEAANZ) Annual Conference 2004, 26-29 September, Brisbane.

Within Europe and North America it has become a favoured instrument for directing economic policy seeking to target small to medium enterprises (SMEs) (Humphrey & Schmitz 1995).

From a regional development perspective, clustering is viewed as offering potential for enhancing economic growth due to the perceived ability to concentrate firms in a geographic area and in doing so increase productivity (Baptista 1998). While many definitions for clusters exist, they are generally identified as possessing at least four dimensions: 1) a geographical focus on a particular region; 2) an institutional focus on networking and linkages between firms; 3) a vertical layer (comprising suppliers and customers); and 4) a horizontal layer (comprising competitors and sources of knowledge, technology or resources) (Muizer & Hospers 2000).

While the benefits of clustering are well recognized, the problem facing economic development agencies is how to identify the existence of clusters and determine how to facilitate their development. Industry clusters are rarely identified in any formal way and many of their member industries and firms may be unaware of the existence of a cluster. This is because clusters usually form through natural inter-firm and inter-industry transactions without the intervention of governmental or third party organizations. Further, it has been found that attempts to artificially create clusters are usually unsuccessful (Porter 2001).

Industry clusters cannot be readily created from scratch but can be facilitated if found to already exist. Successful industry clusters do not generally emerge as a result of government agencies "picking winners", but through recognising and supporting their development. Cluster theory encourages regional economic development agencies to take this understanding to the next level, examining not just these businesses but also the relationships between them (Waits 2000). It is about understanding the linkages between businesses within the cluster to guide planning initiatives that can enhance and strengthen the capabilities of these groups of interrelated businesses (Enright 2001).

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It is through these interrelationships that clusters are formed, agglomerations of industries and associated infrastructure that comprise networks of firms working together or in competition to enhance competitiveness (Guinet 2001). The linkages within a cluster fuel sustainable industry development within a region and can be used as a basis for industry attraction programs within the region. These interrelationships between cluster group business fall into three general categories: 1) buyer-supplier relationships; 2) competitor and collaborator relationships; and 3) shared resource relationships (Anderson 1994). Recognizing the existence of industry clusters, encouraging their development and formulating strategies for their continued growth are key ingredients in the success of regional development initiatives (OECD 2000).

BACKGROUND TO THE STUDY

The Eastern Metropolitan Regional Council (EMRC), a regional council representing the six local government authorities (LGA) of the east metropolitan region (EMR) of the Perth metropolitan area, commissioned the research underlying this paper. Established in 1983 the EMRC is tasked with the development and implementation of regional economic strategies, and the provision of services and facilities for the benefit of the region. Local government is frequently closer to the community than state or federal government and has direct responsibility for many planning, zoning, licensing and infrastructure development issues critical to the success of industry. While LGA have an important role to play in the development of healthy regional economies, their contribution is facilitative rather than direct (Nolan 2003).

The EMRC has a significant role in identifying, understanding and facilitating economic and business enterprise development within the EMR. In an earlier study commissioned by the EMRC the opportunities for using clustering frameworks to facilitate economic and industry growth were examined, with a call for the EMRC to develop a strategic approach to the management of strong predicted future growth within the EMR (Mazzarol 2002).

Each of the five Perth regional metropolitan zones has a different socio-economic mix and is in possession of different comparative advantages in relation to infrastructure and geographic locations. Key factors likely to influence operating location decisions of businesses seeking commercial or industrial land are proximity to transportation routes and customers or markets, availability of skilled labour within the local area, cost of land (either for purchase or lease), inward and outbound logistics handling, utilities, government zoning and regulation, security of the environment and the social infrastructure (Mazzarol & Choo 2003). If the EMR was to secure the most appropriate mix of industry, land use and population it was felt necessary that the EMRC seek to facilitate industry growth.

In 2003 the EMRC commissioned the University of Western Australia's (UWA) Centre for Entrepreneurial Management and Innovation (CEMI) at the UWA Graduate School of Management (GSM) to undertake a study to map industry concentrations within the EMR and identify possible clusters. CEMI was joined in this study by Sensis Pty Ltd, a wholly owned subsidiary of Telstra Corporation Limited, responsible for the conduct of certain activities relating to the *Yellow Pages*® directory and related products and services. Sensis provided data on industry concentrations using its new *Yellow Pages® Business Activity Reporting* service.

PLANNING WITHIN THE PERTH METROPOLITAN AREA

Perth is the capital of Western Australia and the main urban concentration in western two-thirds of the continental land mass. Located on the Swan River estuary the city had a total estimated population of 1.39 million in 2001 or 73 percent of the state's population (DLGRD 2003). With a strong forecast for growth within the WA economy, driven by expansion in the offshore oil and gas, mining and resources sectors, the population of Perth is anticipated to double over the period from 2001 to 2031 (ABS 2001).

Faced with such strong population growth the importance of planning within the Perth metropolitan area is now a major focus for both state and local government authorities. However, systematic regional economic planning within the Perth metropolitan area has received less attention from government than non-metropolitan areas. Planning within the Perth metropolitan area has followed three distinct phases since the middle of the last century. During the mid-1950s the Stephenson-*Hepburn Plan* (1955) predicted a future city economy based on manufacturing industries with railway networks carrying the bulk of human and goods traffic. By the early 1960s the *Metropolitan Region Scheme* (MRS) sought to create a series of multi-purpose centres radiating from the Central Business District (CBD) along established railway corridors, capable of integrating commercial, retail and community facilities. However, by the 1970s it was apparent that services, rather than manufacturing industries were likely to dominate the Perth economy, and regional shopping centres, linked by road rather than rail were the new town centres of the expanding suburbs (Ministry for Planning 1997).

The second phase of planning was heralded by the *Corridor Plan for Perth* (1970), which identified four expansion corridors – northwest, east, southeast and southwest – radiating off the Perth CBD. In addition, five regional sub-centres were identified that would provide the focal point for commercial and retailing business activities. However, this plan was challenged by the concurrent growth of the regional shopping towns, which expanded significantly in the 1980s. By the early 1990s Perth metropolitan regional planning entered a third phase based on *Metroplan* (1990). This continued to plan around the four expansion corridors envisioned in the 1970s, but with eight strategic regional centres. In addition to the CBD, these centres were to become the focal point for commercial office and retailing developments. Industrial development, warehousing and bulky goods operations were to take place on the fringes of these centres to avoid conflicts with transport infrastructure. Greater regulation of Local Government zoning for commercial developments was a feature of this planning.

EAST METROPOLITAN REGION OF PERTH

This brief historical overview shows the planning of the Perth metropolitan area has not been entirely smooth, and there is an over emphasis on transportation and infrastructure with less attention given to the specific needs of industry and community development. There is also a need for LGA to become more actively engaged in regional planning, formulating strategies that can support economic development within their regions, particularly in relation to assisting small to medium enterprises (SMEs). However, such regional planning is usually not easily undertaken by individual LGA due to their jurisdictions being too small. For this reason, regional council structures such as the EMRC encompass a sufficiently large geographic area to enable meaningful regional planning. They are likely to be the smallest jurisdictional authority for such planning.

The East Metropolitan Region (EMR) is one of five zones found within the Perth metropolitan area in Western Australia. The EMR is also the largest of these five zones in terms of total land area, encompassing approximately 2,100 square kilometres, or about one third of the Perth metropolitan area. The region comprises six LGA, consisting of the Cities of Bayswater, Belmont and Swan, the Town of Bassendean and the Shires of Kalamunda and Mundaring. In 2001 the EMR had an estimated population of 257,598 people. Included within the EMR are large sections of the Darling Ranges and the Swan River Valley, containing wine and tourism industries, historic sites and recreation facilities. The region also houses the domestic and international airport, interstate rail-freight facilities and much of the major north-south metropolitan road networks. Population growth rates within the EMR over the period 1996-2001 were 7.6 percent, which were comparable with those of the general Perth metropolitan area of 7.4 percent, but above the national average of 5.7 percent (ABS 2003). The outlook for long-term population growth within the EMR was robust. It was against this background that the current study was undertaken, with the aim of mapping existing industry and employment concentrations within the EMR, and identifying potential industry clusters as a first stage in the development of future industry enhancement strategies.

METHODOLOGY

The methodology used in this study comprised three distinct stages. The first of these involved defining the boundaries of the region and presenting a statistical overview. In the second stage employment and industry concentrations were calculated. Finally, in the third stage preliminary clusters were identified based on the findings of stage two.

Stage 1 – Defining the Boundaries and Statistical Overview

An important first step in any cluster research study is to define the boundaries of the region in which the study is to take place. The EMR has clear administrative boundaries that have been used to define the study area. These were based on the postal codes for the six LGA that comprise the EMRC. With these boundaries determined the research team gathered a range of available data from the Australian Bureau of Statistics (ABS), Sensis Pty Ltd, the Real Estate Institute of WA (REIWA) plus state and local government sources. This provided a detailed picture of the population demographics, employment and industry concentrations and trends, property values and specialized infrastructure within the EMR. This data was then benchmarked against the larger Perth metropolitan area and the state and national averages as applicable.

Stage 2 – Calculation of Business and Employment Concentrations

Industry clusters are most likely to emerge where above average concentrations of employment or industrial activity occur within a given area. Such agglomerations at a local level can create specialization and local production networks (Isaksen 1998). Such networks can be beneficial to SMEs who may sub-contract to larger local firms, share specialized infrastructure, skilled labour or knowledge via interpersonal networking by entrepreneurs (Ostgaard & Birley 1994). Networks enable firms – particularly SMEs – to access specialized services at a discount because they are not required to carry the full cost of developing and keeping such intellectual or physical assets. Clustering supports this process by attracting to a region specialized services that would otherwise be difficult to secure by more isolated industries (Rosenfeld 1997).

The aim of this phase of the study was to identify concentrations or *location quotients* of employment and business activity within the EMR and compare these to the Perth metropolitan, state and national averages. Attention was also given to any evidence of these concentrations having grown or declined over time. This process was facilitated by an examination of employment and business concentrations within industry classifications as defined by the Australia and New Zealand Standard Industrial Classifications (ANZSIC) (ABS 1993). These ANZSIC codes enable the identification of industries down to four levels of detail. When the ratio for a specific industry is greater than one, it can be assumed that the particular industry in the region is significant and may be forming the core of a potential cluster. Using these ratios, all industry sectors in the region can be ranked in terms of their probable importance as exporters and wealth generators (Anderson 1994).

The data used for the employment and business concentration analysis was sourced from the most up to date employment statistics (2001) available through the ABS and most recent business statistics (1999-2002) available through Sensis (Yellow Pages® *Business Activity Reporting*). The employment numbers sourced from the ABS were for the working population. Both the ABS and Sensis provided figures for a range of industries, which are classified within ANZSIC codes from Division to Class. Division ANZSIC codes provide figures for the major industries of which there are 17 in total. These major industries are broken down into more detailed sub-sectors, with the sub-division level providing 53 industries, the group level providing 158 industries and the class providing 491 industries. Cluster analysis utilized data down to the class level from ABS and down to Yellow Pages® heading data. Categories that featured as 'undefined' were omitted, as they did not add meaningful information to the study.

To derive an EMR employment and business concentration for an industry, the percentage of EMR employment/business in an industry was divided by the percentage of Perth, WA and Australian employment/business in that same industry. The calculation

for employment concentrations within industry classifications in relation to Perth is shown below:

$$\frac{\textit{(EMR industry employment/Total EMR employment)}}{\textit{(Perth industry employment/Total Perth employment)}}$$

This provided a ratio of EMR employment and business concentrations within industry classifications in relation to Perth, WA and Australia. Ratios greater than one indicated that EMR employment/business in the industry had a higher concentration than the comparative area. For example, a ratio of 2.0 would indicate that the EMR had a concentration in an industry twice that of the comparative area. The percentage that each of the six LGAs contributed to the EMR concentration was then calculated. This allowed the industries that had the highest ratios at the two-digit ANZSIC level to be generated. This process was repeated for employment ratios for all sub-sectors at the four-digit ANZIC level and at the three-digit level for business ratios. This allowed particular industries that were not captured at their two-digit ANZIC level to be highlighted.

Stage 3 – Mapping Preliminary Clusters

In the third stage of the study the pattern of employment and business concentrations identified in Stage 2 were examined to identify where probable relationships may exist between various industries. This stage was not undertaken using quantitative techniques but required human judgement. Potential cluster groupings are usually based on general industry relationships via conventional supply and value chain interactions. It was the aim of this stage to identify those final suppliers of goods and services within the EMR where concentration ratios were high and to group them with the suppliers of intermediate goods and services and raw materials that might be related in the production chain. Such analysis typically generates from one to six groupings of clusters that appear to exist in the region (Anderson 1994).

FINDINGS

This analysis identified employment and industry concentrations within the EMR that were mapped against each of the six LGA to provide detailed pictures of the general industry structure within each municipality. The pattern that emerged was that of an "inner-EMR" comprising those municipalities located close to the Perth CBD (Bayswater, Bassendean and Belmont), and an "outer-EMR" encompassing the Swan River Valley and Darling Ranges escarpment (Swan, Mundaring and Kalamunda).

The inner-EMR is home to concentrations of industries connected with the road-rail-air transport hub centred on the domestic and international airport, state rail freight terminal, and a major road-rail-freight logistics industrial area "Access Park". Associated with this transportation hub were at least four major industry concentrations: 1) a transport and logistics concentration; 2) a vehicle and machinery concentration; 3) a non-metallic minerals manufacturing concentration, and 4) a wood and paper products manufacturing concentration. By contrast, the outer-EMR was more rural in nature and home to concentrations of industries associated with horticulture, viticulture and livestock husbandry. There were also industries engaged with wine making and food processing located partially in the outer-EMR and also in the inner-EMR. These comprised at least two major concentrations: 1) an agribusiness concentration, and 2) a food and drink manufacturing concentration. Overlaying these broad concentrations were support services and recreational industries. These include horse and dog racing activities, and such activities as property and business services and health services (e.g. ambulance services).

Potential Clusters Identified

From this data, the research team examined possible relationships between industry concentrations to identify three potential industry clusters: 1) a potential transportation, machinery and logistics cluster; 2) a potential building materials cluster, and 3) potential agribusiness food and wine cluster.

The first of these comprised both the air-rail-road transportation hub of the Perth domestic and international airport in Belmont, the Kewdale rail freight terminal, Access Park logistics industrial estate of Forrestfield, and the major road-rail infrastructure of the region. In addition to these core industry sectors, were manufacturers and wholesalers of transportation equipment, motor vehicles, aircraft, railways and logistics handling and lifting machinery. This cluster was likely to be further supported by service operations in storage, retailing, property and business services, communications and information management. Figure 1 illustrates this cluster.

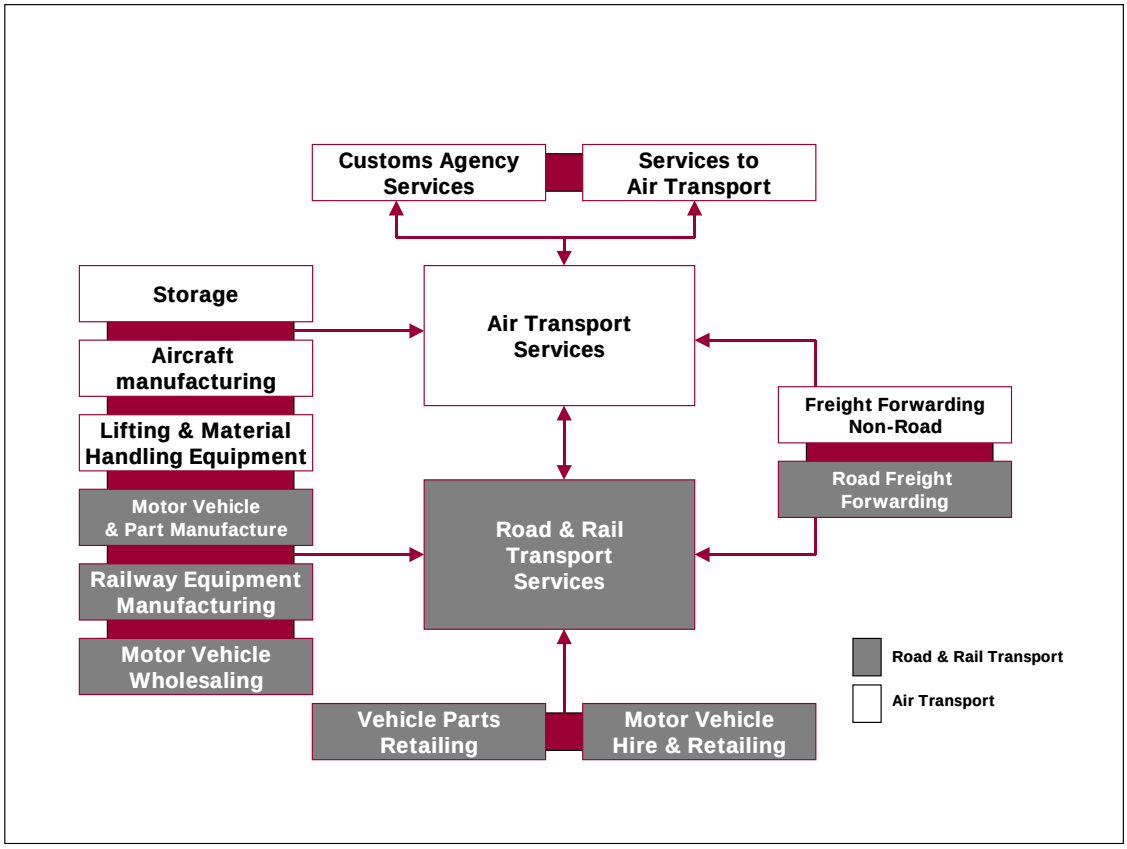

Figure 1: Possible Transportation, Machinery & Logistics Cluster

The second potential cluster appeared to be built around the clay brick, tile and pipe manufacturing industries in Midland and other non-metallic minerals manufacturing. A wood products manufacturing sector, quarrying, and building services, were considered

to possibly compliment it. The ready access of logistics and transportation services were also thought to be of benefit. Figure 2 illustrates this cluster.

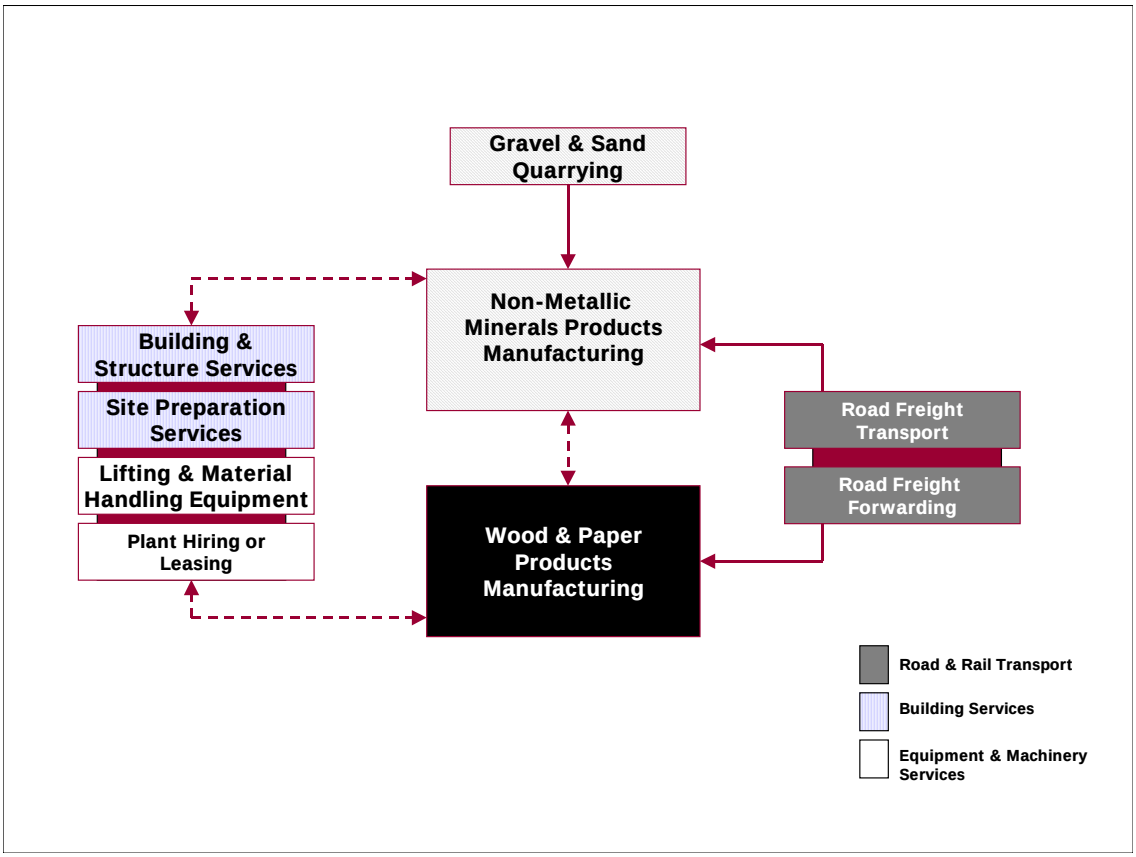

Figure 2: Possible Building Materials Cluster

The third potential cluster was focused on the agricultural activities in the outer-EMR of the Swan, Kalamunda and Mundaring municipalities. These appeared complimented by food and beverage manufacturing and wholesaling industries located within the region. Key agricultural activities included grape apple and pear growing, poultry farming and horse farming. This potential cluster is illustrated in Figure 3.

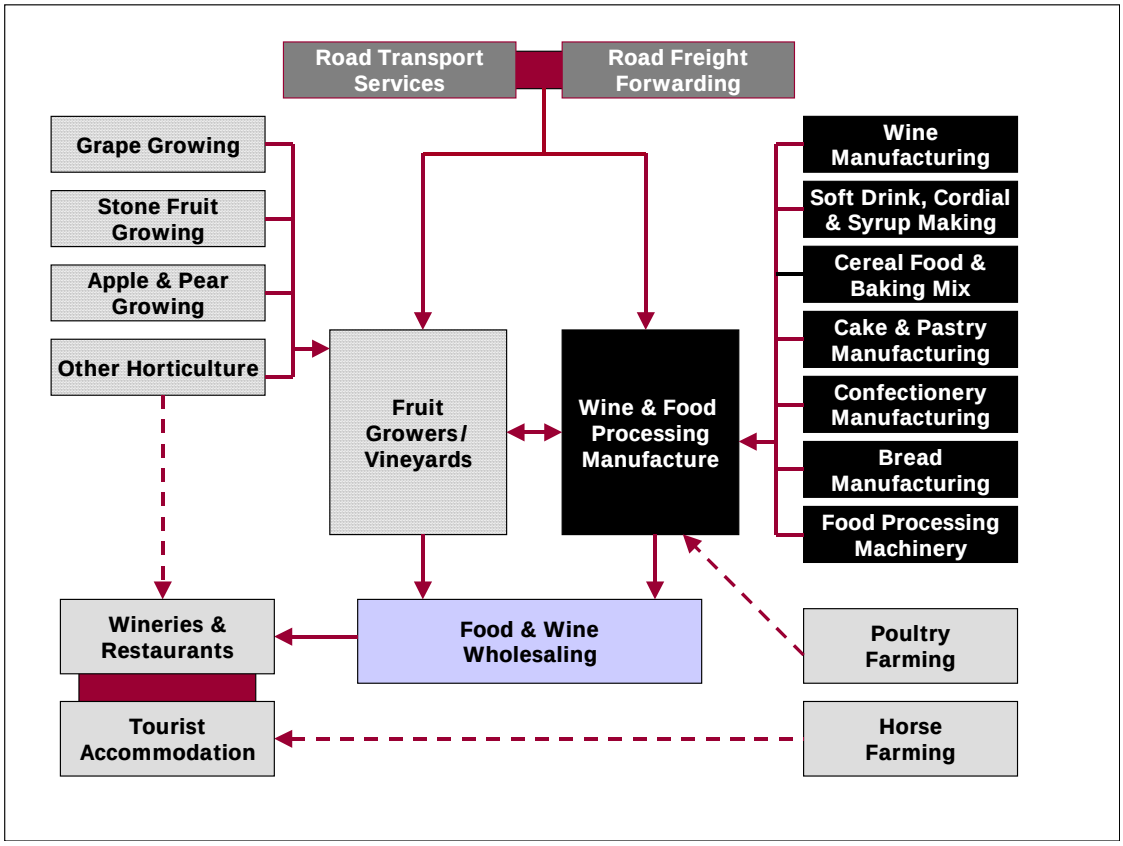

Figure 3: Possible Agribusiness Food and Wine Cluster

DISCUSSION

Within the context of regional economic planning by the WA State Government two key elements have been identified: 1) *catalytic factors*, and 2) *drivers* (DLGRD 2003). The first deals with those things that serve to encourage regional economic growth, such as infrastructure, government support schemes, local procurement, human capital development (e.g. training and education). The second deals with things that promote economic growth, such as investment into the region, inter-regional trade, population and natural resources. In seeking to develop industry clusters it is important to understand the nature of such elements and to address any deficiencies that may exist. Industry is attracted to regions by driver factors, but is frequently retained and expanded though the application of catalytic factors.

Within the three potential clusters identified from the study it was possible to examine the key catalytic factors and drivers. For the transport, machinery and logistics cluster the three key catalytic factors were considered to be influencing industry concentrations. The first of these was the air-road-rail infrastructure, which has been supported by state and federal government policy over a long period of time. This infrastructure was a major capital investment and would remain the core of the EMR for the foreseeable future. The second was the availability of suitable industrial and commercial property sites for firms seeking to locate or expand within the cluster. This was an area over which LGA had more control through zoning and town planning. Industrial land within the inner-EMR was becoming limited and there were community pressures on the LGA to rezone existing industrial land for commercial, retail and even residential uses. Further, some of the industries operating within the cluster were viewed as having negative impact on residential and commercial land use via road congestion from heavy road haulage or noise from aircraft. Finally, the third catalytic factor was the concentration of an appropriately skilled workforce that had established itself within the EMR over previous decades. Future key drivers for this cluster were considered to be LGA land use zoning that attracted or repelled additional firms within these industry sectors, and growth in the wider WA economy, particularly in international and inter-state trade.

For the potential building materials cluster five catalytic factors were identified. The first of these was the road-rail infrastructure within the EMR and its ability to provide access elsewhere within the Perth metropolitan area, and state. The others were the availability of transportation services; the availability of raw materials (e.g. sand and clay); the availability of suitable industrial and commercial property sites; and, the concentration of an appropriately skilled workforce. As with the transport, machinery and logistics cluster the key driver for this building materials cluster were the land use zoning policies of the LGA that were likely to attract, retain and permit the expansion of firms within these industry sectors. Another key driver was the growth in the wider WA economy, particularly in the housing and construction sectors.

For the potential agribusiness, food and wine cluster the study identified four catalytic factors. These were the availability of suitable agricultural land, access to transportation routes to markets, the availability of suitable industrial and commercial property sites; and, the concentration of an appropriately skilled workforce. Future key drivers for this cluster were considered to be LGA land use zoning that attracts, retains and permits the expansion of firms within these industry sectors, and the development of further infrastructure particularly tourism related. With respect to these catalytic factors and drivers, the overall growth of population within the EMR had begun to place increasing pressures on the availability of agricultural land in the outer-EMR. The sprawl of Perth's residential suburbs in the fertile soils of the Swan River Valley and Darling Range escarpment were threatening the future sustainability of the viticulture, horticulture and intensive animal husbandry industries. Rising property values within the EMR made it more attractive to sell off high quality agricultural land for housing sub-divisions. LGA were experiencing pressures from community groups seeking to advocate development or status quo.

The study identified the need for further research to be undertaken to verify the existence of these potential clusters. This would best be conducted through direct survey of firms within the various industries comprising the clusters, with a view to examining their supply-chain relationships, networking behaviour, employment and growth aspirations and concerns over infrastructure, location advantages and government policy. In doing so it was considered desirable to identify local production networks and to recruit “cluster champions”, or prominent business leaders, entrepreneurs or companies willing to lead and energize the local business community within their industries and provide guidance to regional economic development policy makers.

CONCLUSIONS

The findings from this study were adopted by the EMRC and used to guide further cluster development work involving the targeting of selected industries. Assisted by cluster development consultants, the EMRC and its six LGA commenced a process of direct

industry engagements with firms in two sub-sectors identified in the research as being significant emerging concentrations. The first of these was that of "mining and technology services", the second that of the "heavy vehicle, machinery and equipment manufacturing sectors". It was decided not to focus on the building materials sector because vertically integrated companies already dominated it. This offered limited returns for the investment of the limited resources available to the EMRC. Further, the agribusiness cluster had already been subject to some attention. This had shown that the mostly small, family-owned producers in this latter cluster were largely unresponsive to cluster development initiatives from local government. As the EMRC explained:

"Rather we have focused on two sub-sectors that were identified in the research as being major contributors at the 3 digit level - the 'mining and technology services' and 'heavy vehicle, machinery and equipment manufacturing' sectors (which is really two groups combined into one as there is a fair degree of overlap). These two sectors also tend to overlap within the metals/engineering sector which supports/services the mining sector. These groups have the majority of their sub-sectors showing high location quotients and we believe have the capacity to generate significant new skilled employment, particularly given the recent resource project developments (which by the way is also creating huge problems for the companies as the labour market becomes tighter and tighter)."

According to the EMRC its decision to adopt an industry cluster approach as a key economic development strategy was its belief *"that sustainable growth is best achieved by building upon the region's existing economy"*. The cluster mapping study described here helped the EMRC develop a better understanding of the economic structure of the EMR and its comparative strengths. Over the long-term, the EMRC plans to establish a portfolio of industry clusters based on the region's key and emerging industry sectors.

From the perspective of small business development, cluster analysis research of this kind can provide insights into the location and nature of industry concentrations and assist both policy makers and the business communities to better understand the dynamics of their regional economies. Within most regional economies the majority of

businesses are SMEs, however, there is frequently an absence of reliable information on the size, structure, distribution and growth rates of such firms. Without a reliable picture of the industry landscape policy makers in local, state and federal government agencies are vulnerable to making incorrect decisions in relation to targeting industry assistance programs.

It is important that industry concentrations, industry supply-chains and inter-firm local production networks are mapped and understood prior to the development of regional economic development or industry support programs. Such information offers enhanced targeting and the prospect of more accurate monitoring and measurement of the impact of such programs.

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