

# Managing the Provision Infrastructure in support of Industry Cluster Development: the case of Ho Chi Minh City

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## Abstract

*Vietnam has experience a period of rapid economic growth in the past decade with the transition from a centrally planned to a more decentralized and open market economy. Ho Chi Minh City (HCMC) is the country's largest city with a population approaching 5 million and principal centre of commerce and manufacturing. With the rapid growth of urban development, HCMC continues to experience major problems in managing the demand for infrastructure service to its expanding industrial base. This article describes the process undertaken by the authors, working with limited data and resources in Vietnam, to establish a methodology which links an analysis of industry clusters with the provision of infrastructure. The results of this analysis have been used to define priorities and location of key infrastructure needed to support the sustainable development of the city in future.*

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## Introduction

Managing the provision of infrastructure is critical to the economic development and competitiveness of cities and regions. Nowhere is this more important than in the developing countries of the world where the demand for infrastructure often falls well behind the capacity of governments and the private sector to meet supply. To maximize economic possibilities and attract investment to cities, governments and businesses are concentrating on the development of industry clusters. Industry clusters are becoming increasingly specialized, as are the requirements of infrastructure to support their development. However, the relationship between the provision and management of infrastructure and industry cluster development is not well understood.

Much has been written on cluster analysis in respect of the value of the technique for defining strategies in support of established and developing industries (Porter 1990; Department of Housing and Urban Development (HUD) 1996; Held 1996; Audretsch and Feldman 1996). However, in terms of its practical usefulness in the strategic management process for cities, the value of the technique is circumscribed by the lack of linkage to, and direct implications for physical planning. This limitation is particularly important in developing countries where the basic infrastructure to support clusters is often inadequate and there are very limited funds to undertake the required investments to improve it. Cluster analysis is potentially an extremely useful tool for prioritising infrastructure provision in support of economic development - provided the linkage from industry strategy to infrastructure investment can be made.

This article describes the process undertaken by the authors, working with limited data and resources in Vietnam, to establish a methodology which links an analysis of industry clusters with the provision of infrastructure. This task was undertaken successfully. While significant gaps remain in the methodology, they can, in principle, be bridged using existing techniques and data sources available in most countries. These techniques and data requirements are described in Section 2. However, even in the crude form developed here, the analysis is useful and can be utilised on a routine basis.

## **An Overview of Cluster Theory and its Implications for Infrastructure Management**

Industry clustering is not a new phenomenon. It has been studied by geographers since the 1930's. Michael Porter's research on competitiveness was important in helping to explain factors that drive the development of industry clusters in cities and regions (Porter 1990). Global experience suggests industry clusters are having an increasingly important role in driving the growth of regional economies. Collectively, 18 industry clusters in the USA provide 54 per cent of employment (HUD 1996). Research in developing countries also indicates the increasing importance of industry clusters in driving regional and local economic development processes (Fairbanks et al. 1997; ICF Kaiser 1997).

The historic basis of clusters was the agglomeration of industries with strong vertical and horizontal links to a core business activity such as a car assembly plant, shipbuilding or food processing activity. The globalization of the world's economies, however, is leading to very different types of industry clusters that are becoming highly specialized. Core industries are less defined and source materials and components from suppliers and distributors operating in global and national markets. Vertical and horizontal industry structures are being replaced by networked structures. The old industry clusters were the products of government policies designed to build national industries in strategic locations. The new industry clusters are the products of global corporations seeking achieve competitive advantage.

The contemporary definition of industry clusters is that they comprise a synergy of multi-sector related enterprises that comprise highly specialized value-adding businesses/industry activities that generally have need of spatial association. Local industry/ social networks are an important component of cluster development. Equally important is strategic infrastructure. Strategic infrastructure comprises hard infrastructure (airports, telecommunications etc.) and soft infrastructure - in particular technology, learning and information systems. Investment in strategic infrastructure is multi-sectoral. Thus current thinking in developing successful industry clusters is being directed towards integrating multi sector development of strategic infrastructure to create a position of competitive advantage for targeted industry clusters to nurture and grow. Much of this paper is concerned with developing the relationship between cluster development and multi-sector infrastructure investment.

The above theory defines how to approach cluster analysis, however, the practical issues of data collection and analysis are often ignored in the literature. Roberts (1997) sets out a methodology to operationalize these techniques and this methodology was used in the Vietnam case. The supplier and customer linkages of the identified clusters imply infrastructure investment needed to support the development of the priority clusters. It is possible to survey companies in these industries in order to determine which investments would have the most significant effect on increasing total value added by the cluster. In HCMC, the priority industry infrastructure needs are evident from focus group discussions with industry representatives and planners. Such an analysis is useful because, if it identifies clusters, considerable economies of scale may be achieved in infrastructure provision and issues of support to clustered industries, additional to those of a generalised industry policy, are raised.

## **The Economy and Industry Clusters in HCMC**

### ***Structure of the Economy***

HCMC has a population of over 5 million and is Vietnam's largest centre of production. HCMC's manufacturing industries contribute over 45 percent of national industrial economic output, much of which is exported to Southeast Asian countries. Since 1990 the economy of the region has grown rapidly, driven by substantial foreign investment in textile, food processing, chemical and petroleum industry enterprises. The economic growth rate of the city before the Asian crisis was in the order of 16 percent, compared to 9.5 percent for Vietnam. Gross Domestic Product (GDP) for HCMC in 1997 was estimated at 41.91 billion dong. GDP per capita for the city is estimated at U.S. \$1,500.

The manufacturing sector contributes about 32.7 percent to the city's GDP and trading comprises 17.6 percent. The structure of the economy is changing rapidly and it is to be expected that in future services will be of greater importance. Higher value added manufacturing is likely to take place in the new export processing zones currently being established on the periphery of the city and in surrounding districts.

### **Employment Structure**

Reliable figures on employment for HCMC are very difficult to obtain. The HCMC's Department of Statistics prepares annual estimates of employment. In 1997 the estimated labour force was 1.9 million people in full employment. A further 600,000 people were involved in domestic and part-time employment within the informal sector. The manufacturing sector employs over 24 percent of the city's workforce. The trading sector, including hotels and restaurants, employs 17.8 percent and the primary industries sector

over 11 percent of the labour force. The workforce has been growing at over 10 percent, or approximately 160,000 jobs per year.

Table 1 shows the change in employment structure in HCMC between 1995 and 1997. There have been some significant shifts in percentage and absolute terms in employment within industry groups. Overall, the manufacturing, mining and public utilities sectors grew by 34 percent or some 25,000 jobs over this two-year period. The largest among other fastest-growing industry activity in is tanning and the production of leather products. This industry grew by 44.9 percent in two years and created over 18,000 new jobs. The rubber plastics industry, paper or paper derivatives and machinery and electrical appliance industries also grew rapidly. Several industries have experienced a significant decline in employment. The wood processing industry lost over 5500 jobs and the food processing machinery and transport industries 2,500 jobs respectively. High rates of job loss also occurred in the state-owned enterprise sector, especially the garment, food processing and leather processing industries.

**Table 1 Industry Employment 1995 - 1997**

	1994	1995	1996	1997	% 97	% Growth 1994-97	
Food Processing	48950	51627	47379	49224	11.7	0.6	274
Tobacco	6178	4493	4304	4343	1.0	-29.7	-1835
Textiles	51488	53897	50898	53212	12.7	3.3	1724
Garment	68155	92429	91195	94851	22.6	39.2	26696
Leather Products	24318	41608	49796	60297	14.3	148.0	35979
Wood Processing	18758	18590	15167	13020	3.1	-30.6	-5738
Paper	5525	6397	6982	8441	2.0	52.8	2916
Publications	7882	8596	8334	8732	2.1	10.8	850
Coking Coal	18	37	87	41	0.0	127.8	23
Chemicals	15330	16463	16813	17814	4.2	16.2	2484
Rubber and Plastics	13024	19259	22338	26226	6.2	101.4	13202
Non- Mineral Products	12240	12119	12949	11778	2.8	-3.8	-462
Metal	9286	7245	7673	7794	1.9	-16.1	-1492
Metal Products	17678	23127	21316	23293	5.5	31.8	5615
Machinery	5990	8342	8731	7059	1.7	17.8	1069
Electrical Appliances	1928	3215	4635	5148	1.2	167.0	3220
Television/ Communications	5570	4717	4128	4519	1.1	-18.9	-1051
Medical Instruments	1089	918	1753	2143	0.5	96.8	1054
Motor Vehicles	3312	2377	2925	2701	0.6	-18.4	-611
Other Transport	6849	8051	4961	5439	1.3	-20.6	-1410
Furniture	4952	10470	9977	12106	2.9	144.5	7154
Other light manufacturing	1787	1265	1401	1335	0.3	-25.3	-452
Misc manufacturing	346	532	386	1030	0.2	197.7	684
<b>SUM</b>	<b>330653</b>	<b>395774</b>	<b>394128</b>	<b>420546</b>	<b>100.0</b>	<b>27.2</b>	<b>89893</b>

Source: Statistical Year Book 1998

The significant shifts observed in the manufacturing and construction sectors are the result of structural reforms within the city's economy. Private trading companies and foreign ventures accounted almost entirely for the growth in employment in the manufacturing, transport and public utility sectors. It is expected that there will be further job losses in state-owned enterprises as the city's economy undergoes further restructuring. The impact of restructuring on industrial establishments is shown clearly by the decrease in numbers between 1995 and 1997. The city lost almost 4,200 businesses in this period (Statistical Yearbook 1998). Most of these were in the small business enterprise sectors in the textile,

garments, food processing and metal product sectors. The economies of scale achieved by larger, often foreign-owned enterprises are making many small enterprises and state-owned enterprises uncompetitive. It is expected that there will be a significant reduction in small-scale enterprises in the city in future. Some of these will relocate to surrounding districts, although most will dissolve through the inability to compete.

### Gross Production of the HCMC Economy

Table 2 shows the gross production for the manufacturing sector of HCMC from 1995 to 1997. These figures are shown in constant prices. The food and beverage industry shows the highest absolute growth in gross production. This is followed by chemicals, garment manufacturing and metals production. The garment, machinery and equipment, electrical appliances, other light manufacturing, leather and food processing industries gross product grew as much as 90 percent for the two-year period. These data suggest that several industries in HCMC are becoming highly competitive as the result of foreign investment capital that has improved management, production and integration into global distribution networks. There is strong evidence of industry clusters developing in the region. The table shows the wood processing, television, and motor vehicle sectors had negative gross production figures, suggesting that these are currently less efficient or uncompetitive industries.

**Table 2 Gross Production 1995 - 1997 (Bn VND Constant Figures)**

Industry	1995	1996	1997	% Change	Change Total
Mining	60.65	70.20	73.00	20.4	12.35
Foodstuff and beverage	8253.50	10125.60	10948.80	32.7	2695.30
Tobacco	1945.80	2195.30	2171.60	11.6	225.80
Textile products	2539.60	2790.90	3172.30	24.9	632.70
Garment	1354.00	1691.60	2201.50	62.6	847.50
Preliminary leather, tanning, production of valises, bags	1225.10	1460.60	1897.20	54.9	672.10
Wood processing and wood, bamboo products	713.50	628.30	610.60	-14.4	-102.90
Paper and its derivatives	638.10	762.70	1035.60	62.3	397.50
Publication, printing and photocopying	906.90	1037.70	1167.40	28.7	260.50
Coal	0.60	0.60	1.40	133.3	0.80
Chemicals and chemical products	2477.20	3020.30	3571.30	44.2	1094.10
Rubber and plastic product	1569.70	1969.70	2265.80	44.3	696.10
Non-metallic mineral products	1572.70	1799.10	2247.80	42.9	675.10
Metal	1291.10	1491.50	1376.30	6.6	85.20
Metal products	961.40	1189.90	1882.20	95.8	920.80
Machinery and equipment's unclassified	412.40	576.50	783.40	90.0	3710
Machinery and electric appliances unclassified	246.70	315.90	448.40	81.8	201.70
Radio, TV sets and communication equipment	995.30	1023.40	884.40	-11.1	-110.90
Medical instruments, optical instrument, clock all kinds	131.80	197.10	239.50	81.7	107.70
Motor vehicles, trailers	392.80	411.20	377.00	-4.0	-15.80
Other means of transport	327.80	364.50	403.40	23.1	75.60
Bed, cupboard, tables, chair, products unclassified	363.80	383.90	447.30	23.0	83.50
Other light manufacturing	67.70	107.90	158.80	134.6	91.10
Electricity prod. and supply	808.50	886.50	900.80	11.4	92.30
Water production and supply	254.10	269.70	268.20	5.5	14.10
<b>SUM</b>	<b>29510.75</b>	<b>34770.60</b>	<b>39534.00</b>	<b>34.0</b>	<b>10023.20</b>

Source: Statistical Year Book 1998

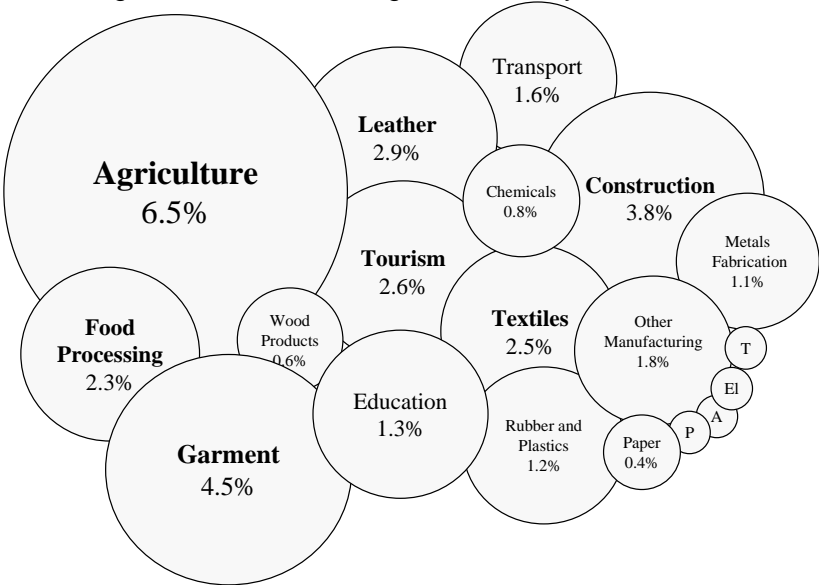
### Industry Clusters Identified

Enhancing the economic performance of an urban area requires a staged process of strategy development. This involves identifying: industry clusters and constraints to their development; market opportunities for existing and potential clusters and constraints to taking advantage of these opportunities; and a set of actions to overcome constraints and support existing strengths. Deriving from the theory, in particular Porter (1990) and the work of ICF Kaiser (1997) there is a four stage process for cluster analysis which was applied for the case of HCMC.

**Stage 1: Identify Industry Clusters**

Industry clusters can be identified using both quantitative and qualitative techniques. A cluster is a spatially concentrated grouping of industries with intra-industry, supplier or customer linkages that display a stronger relationship than could be expected from arms-length dealing in markets. Industry clusters may be a local or regional phenomenon. Concentrations of employment or output can be used to identify spatial patterns of industry establishment or production characteristics. These concentrations are established by comparing sub-regional or regional characteristics with those of larger areas - at regional, national or international levels as appropriate. A location or city that has employment characteristics for an industry that is significantly different from the higher level statistics chosen for comparison, should be considered a cluster. From the analysis it is possible to describe the key characteristics of industry clusters within a sub-region or region.

To develop an understanding of the structure of industry clusters in HCMC, data from several databases containing information on employment, production and output were used to develop a crude input output assessment of employment associated with different industries in HCMC. The analysis shows the presence of industry clusters of significance to the city (see Figure 1). The largest industry cluster, which is to be expected, is agriculture. The city still has large areas of agricultural land within its boundaries. Other important clusters are construction, tanning and leather products, food processing, garments and textiles. Smaller but important clusters in the region's economy are education, tourism and transportation. There are several smaller emerging industry clusters that will make an increasing contribution to the region's economy in the future.

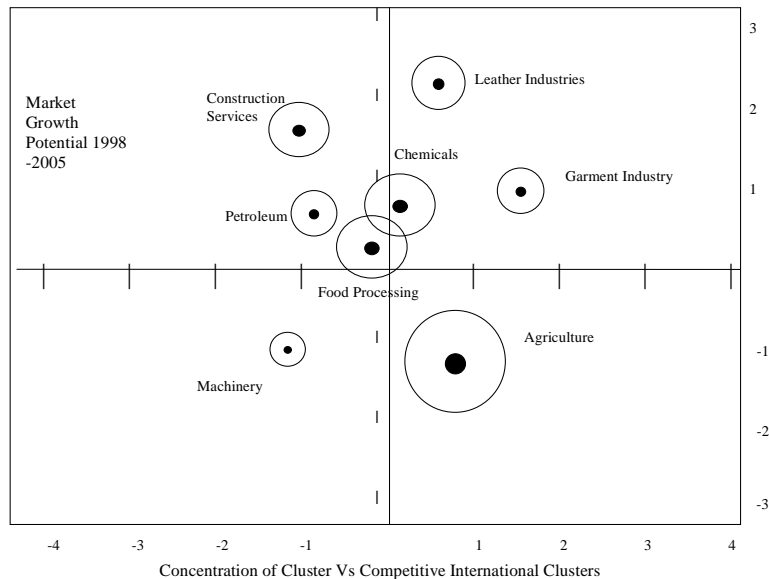


**Figure 1 HCMC Industry Clusters**

## Step 2: Identify Market Potential of Local Clusters through Analytical Techniques

The second step in the industry cluster building process is to analyse the relative strengths of each cluster in terms of market growth potential and competitiveness within a metropolitan, national or international market place. This is undertaken using survey techniques or focus groups.

Figure 2 shows the competitive position of industry clusters in HCMC. These can be plotted and described by using concentric circles to scale relative importance to competitor clusters and markets. The assessment was undertaken using a available reports, a focus group and consultations with key industry leaders. From this type of analysis important decisions can be made about how to reposition or to maintain stability of an industry cluster relative to competitor clusters and markets and important infrastructure priorities can be suggested.



**Figure 2**Identifying Market Potential of Local Cluster through Analytical Techniques

Market potential analysis becomes an important basis for strategy later in the industry cluster building process. To be competitive, industries must understand the comparative advantage that a cluster might have, and how these advantages can be leveraged or stretched to develop new economic possibilities. Market potential analysis requires a careful evaluation of competitor products and markets, especially their growth potential and marketing strengths.

While an industry cluster may hold a weak competitive position and limited potential for growth in market share, this does not mean that it should, necessarily, be given a low priority for support. Weak competitive positions can be improved - witness the Australian automotive industry. Many small clusters provide highly specialised services in a global marketplace, continue to experience growth, but lose relative market share because of the rate at which a market is growing. This is true of software industry clusters. In the case of HCMC, this analysis provided a context for infrastructure provision in that it identified priority areas for support - textiles/ garments, food processing and chemicals in particular.

### Step 3: Analyse Intra-industry, Supplier and Customer Linkages

Step 3 in the industry cluster building process involves a detailed investigation of the linkages, core industry suppliers and distributors that support an industry cluster. The volume, type and value of these linkages should be investigated, together with common user suppliers and distributors for different business units forming the industry cluster. Common user suppliers often service more than one cluster. The absence of a key local or co-industry supplier may create an opportunity for import substitution suppliers - although they would need to be competitive. Attention must be given to seasonal and market factors associated with suppliers and distributors; the propensity to out-source externally from local markets for services; and needs for particular specifications, quality assurance standards or conditions applied to delivery of products and services. These issues can have implications for infrastructure provision.

The conceptual format used for the analysis is set out in the table below. The vertical axis of the matrix lists the 22 industry clusters. The horizontal access are lists over 60 industry groups classified using international Standard Industry Classification (SIC) two digit numbers. In relevant boxes in the matrix industries with backward or supplier linkages to each cluster industry were recorded with a capital S. A group industry that had a forward or customer linkage was recorded with a capital C. Industries that involved intermediary transactions between the same industry sectors were recorded with a capital I. Government services involving regulation of industry activities was denoted with a capital R. By entering these transaction relationships into a matrix, the complexity of interaction between industries becomes more apparent.

Industry linkages were analysed using the framework described in Figure 3. In the case of HCMC, no major additional issues or constraints were raised by the linkage analysis. The level of analysis carried out was adequate for an initial study of this type, but additional resources should be used to further elaborate the analysis in support of more refined targeting of infrastructure investment.

SIC Code	16	20	22	23	24	25	25	..N	Total
Ind Cluster A		C		C		C		S	4
Ind Cluster B	S		I	S		I	S	C	6
Ind Cluster C		C	C	C	C	S	S		6
Ind Cluster...D	C	I		R		S			4
Σ Suppliers	1			1		2		1	5
Σ Customer		2	1	2	1	1	2	1	10
Σ Intermediate	1	1	1			1			4
Σ Regulation				1					1
Total	2	3	2	4	1	4	2	2	20

Table 3 Supplier/Customer/Regulation transaction matrix used for Analysis of HCMC

### Step 4: Identify the Key Constraints and Opportunities Needed to Develop the Clusters

There are five key elements that form the economic foundation that support the development of industry clusters. The first is the availability of skilled and adaptable human resources, for example, the availability of multi-skilled, multilingual, and contract labour. Secondly, technology availability is important to improving production efficiency. The wide use of Computer Aided Design (CAD), Computer Aided Manufacture (CAM) and Geographical Information System (GIS) systems to assist manufacturing and analytical processes is



important to improve the efficiencies of production processes and the delivery of value-added producer services. Thirdly, physical and information infrastructure, from basic roads, drains and waste management at one level to fibre optic cable systems, data processing centres and advanced public transportation systems at another level. Education, training and community facilities also have a significant impact upon equipment and human performance in supporting the development of industry clusters and attracting new industries to regions.

Fourthly, access to financial capital, for example equity, venture capital, debt financing etc, is an important economic foundation supporting investment in industry clusters. Finally, the taxation and regulatory environment has a significant impact on the cost of business and economic performance. Regions that offer incentives in the form of taxation incentives for research and development, flexible building codes, sound policies on environmental performance and support for cleaner production provide the kind of economic foundations that foster industry cluster development.

The constraints identified in the fourth step will include infrastructure constraints and the process of prioritisation of the relevant infrastructure needs to be undertaken in the context of a coherent economic and spatial development plan for the city region.

The development of industry clusters in HCMC is constrained by many factors. Four specific long-term issues that must be addressed to improve the capacity for building of clusters are discussed below.

#### ***Value Adding and Links to Suppliers and Markets***

The focus of much of industry policy and development in HCMC has been on first stage manufacturing such as chemical and textile products. Most of these are industries are labor intensive, pay low wages and have low value added output. In many industries specialised products, labour and technology are imported. The adding and retaining of more of the value added is difficult because there is a tendency for foreign manufacturers to operate within their own specialised supplier and customer networks. Breaking into these networks is a function of building close relationships grounded on good performance in terms of quality and quantity.

#### ***Industrial Location Policy***

The failure of the master planning process to encourage a greater concentration of closely linked supplier and distribution businesses in the new industrial estates, has resulted in a distributed pattern of industry that is not able to take advantage of synergies that operate when industries share common and often local competitor suppliers and distributors. The last three master plans for HCMC do not provide for mixed-use development. Modern production demands the integration of business services, warehousing, transported distribution, commercial centres, storage and business accommodation in close proximity to each other. Except where there is potential danger caused by noxious industries, co-location of services is essential to modern business and industry development.

#### ***Poor Industry Networks and Strategic Leadership***

Network development is critical to capacity building of industry clusters. Successful clustering is, in large measure, dependent on the rate and extent to which information passes between organisations in one locality involved in similar business activities. Networking accelerates innovation and product development. Network building is important to establishing a foundation for building trust, which leads to local businesses seeking greater corporation, coordination and collaboration on product or service development.

Vietnam business network development is weak. This is understandable, given that the central planning policies usually involved businesses keeping rather than giving away information. Building industry networks through the forming of associations, conferencing and workshops is required to accelerate inter-personal knowledge flow and information in an industry cluster.

Network building needs to be done in the context of a strategic vision for the clusters in question. Strategic leadership involves setting directions that create an over the horizon vision of where businesses involved in a cluster should be heading in future, in product development, production and markets. Encouraging captains of industry to collaborate in roundtables and other forums is important to the building of strategic leadership.

This leadership needs, in particular, to address issues of skill shortages, Regulation, Management and Access to Markets. These issues are described briefly below.

#### Skill Shortages

Major transformations are taking place in the formal economy, especially in the state-owned enterprises, where substantial closures and job losses are occurring. Improvements in the technical and advanced education sector, technology base and capital available for training are needed so that unemployed, unskilled labour can be trained to relocate to meet labour shortages in other industries.

#### Regulation

The National Government has introduced a large number of decrees pertaining to the planning and development of the economy. The enactment and operationalisation of decrees is slow. While attempts are being made to streamline regulation procedures, there is still a need for greater simplification and consolidation of multiple decrees.

#### Management

The transition from a socialist to a more market orientated economy has presented significant problems for management in government and state-owned enterprises especially in respect of: financial planning, marketing management, production management, quality assurance and strategic planning - all compounded by lack of transparency in organisational relationships.

#### Access to Markets

Most of the foreign venture industries and partnerships have access or form part of the distribution network that is controlled by large multinational corporations. Such corporations control the flow of goods and services into global markets, which makes it extremely difficult for Vietnamese companies to trade independently of these distribution networks. The inability of Vietnamese firms to develop or gain access to independent distribution networks is a major constraint upon local business development. A critical element of business network building in the future will be to develop independent networks or business alliances with secondary distribution networks to enable more local goods and services to gain access to second order markets in the global economy.

#### **Inadequate Basic Infrastructure**

The lack of adequate basic infrastructure is a problem for all industries in Vietnam. Building industry capacity will take many years. Subsequently slack production capacity will be experienced in many industries until infrastructure constraints can be overcome. It is essential that priority be given to investments in public infrastructure that will service the primary industry clusters such as agriculture, petroleum and chemicals. These industries provide much of the basic feedstock, refined products, energy and resources needed to support higher level value added production industries. To facilitate cluster building it is

necessary to focus upon the building of strategic infrastructure. This specialised infrastructure is critical to supporting the development of industry clusters.

Anecdotally, constraints on business development caused by the lack of infrastructure are important. Persistent power cuts are manifest and cause substantial additional cost for industry. The national government and the HCMC People's Committee are taking steps to redress infrastructure problems, but the lack of coordinated and multi-sectoral planning and goal setting on strategic directions for industry development makes it difficult to set priorities for infrastructure investment. Key shortages in infrastructure across the city are electricity, with water supply and sanitation services being a major problem in newly developed areas. Telecommunication services are improving rapidly, however the capacity for large data transfer via the Internet is a major constraint on the development of business services.

A high priority for the development of infrastructure is to identify industries that have a strong competitive advantage to produce and export value added goods and services that will help build the wealth base of the city. Current economic and planning policy is not well focused or coordinated. Subsequently, all sectors of the economy are creating demands upon limited public funds for infrastructure and services, so that the city is not able to apply its limited resources to those industries and locations that need high-quality structured services to maximise economic output. There is a need for a more strategic investment focus on infrastructure projects that support the development of industry clusters which will maximise the economic development potential of the city's economy.

### ***Future Focus of Economic Strategy for HCMC***

In the context of the factors identified above, crucial to the development of the clusters identified will be the facilitation of industry:

- Moving up the value added industry chain
- skill development including retraining initiatives for the under and unemployed
- Focus on industrial ecology and cleaner production
- Import replacement
- Development of value factors such as information gathering and dissemination, management skills development to support export orientation industry clusters, strategic leadership and
- More efficient regulation including the development of partnerships with the private sector and the community to provide basic infrastructure and to manage services.

In respect of the clusters identified, the competitive analysis undertaken in this section has indicated that the garment, textile, leather and chemicals industry has competitive advantage and the food processing industry has some growth potential. These industries broadly meet the objectives of the strategy outlined above, being steps up the value added chain, a source of current imports and relatively labour intensive (in order to relieve unemployment). While some are potentially polluting, a well-resourced and coherent waste management strategy can address this issue - particularly in the context of focused investment in industrial estates. Thus, together with tourism, these industries will be the focus of the following analysis.

### ***Spatial Structure of Industry Clusters in HCMC***

The Statistical Year Book (Statistical Office of HCMC 1998) provides substantial city-wide information on industry, agriculture, construction, foreign investment, trade, transport, culture and education. Very little spatial or statistical data at the district level is available for HCMC. In 1997 the project VIE/95/051 for "Strengthening the Capacity for Urban Management and Planning in HCMC" obtained a database from Telstra (Australia) of all businesses in HCMC recorded in the Yellow Pages phone book. This database contains information on the type,

location, capital and employment for businesses whose names appear in the phone book. The database included a broader category of industry classification, which was subsequently re-coded using Standard Industry Classification (SIC) by industry categories.

The database used for the analysis contained 2,696 records of business establishments in HCMC and three surrounding districts. Total employment recorded was approximately 300,000, which represents about 14 percent of the HCMC formal labour force. The sample used comprises most large and medium scale industries (employment over 20 persons) that are the core of export and regional production and higher order services in the city. The data, therefore, provides a reasonably reliable information source to draw conclusions about the structure and location of industry concentrations at a micro-level in the city. Further refinement and upgrading of the data base is required to improve the accuracy of analysis reported below.

The overall concentration of employment for HCMC (based on the database) was applied to a GIS. The highest concentrations of employment occur in Districts 1 and 5 and Quan Binh Thanh district. It is not expected that the pattern of employment intensity would change significantly if comprehensive data were available for the entire city. However, as discussed in section 1, employment in the manufacturing sector is rapidly decentralising, while the spatial densities of outlying industrial districts is much less than that of the central city.

The database was manipulated to identify where concentrations of industries were occurring in HCMC. All districts which had employment characteristics by industry group greater than one standard deviation measured across all districts of the city was considered to be significant in terms of an industry employment concentration. This micro-concentration of employment in the city has been used to provide a clearer picture of the structure of industry clusters in the city as a whole. Micro-concentrations of employment may also provide important clues about distributor or supplier networks for the core industries within larger industry clusters. This appears to be the case for HCMC.

### **Manufacturing Clusters**

The analysis of cluster data is shown in Table 3 and demonstrates the importance of district 1 as a major transportation centre. The extent of employment location at the airport and the port of Saigon are shown clearly in the analysis with standard deviations from the mean concentrations by industry at provincial level exceeding three.

### **Service Clusters**

Very little attention has been given to the clustering effect of service industries in HCMC. The spatial analysis of service industries set out in Table 4 shows that Districts 1 and 3 are the prominent service centres for the city. These two districts experience the highest concentrations of wholesale trade, general merchandise, and restaurants, finance institutions, hotels and business services. There is evidence of increased commercial and hotel concentration near Than Son Nhat international airport with the emergence of a commercial axis between the airport and the Central Business District (CBD). The database does not contain sufficient up-to-date records to assess the impact of changing commercial structure within this corridor area. Further research is required on the planning of this corridor if traffic and infrastructure problems are to be avoided in future.

**Table 3 Districts with Manufacturing Industry Employment Concentrations (Standard Deviations)**

<i>Industry<sup>2</sup></i>	<i>N</i>	<i>C<sub>g</sub></i>	<i>C<sub>h</sub></i>	<i>S<sub>c</sub></i>	<i>F</i>	<i>T<sub>p</sub></i>	<i>T</i>	<i>G</i>	<i>W</i>	<i>F<sub>u</sub></i>	<i>P<sub>a</sub></i>	<i>P<sub>r</sub></i>	<i>C</i>	<i>P<sub>e</sub></i>	<i>R<sub>p</sub></i>	<i>L</i>	<i>B</i>	<i>M<sub>e</sub></i>	<i>I</i>	<i>E</i>	<i>T<sub>r</sub></i>	<i>I<sub>n</sub></i>	<i>M</i>
Quan 1		4.3		1.9	2.6							1.1	3.1						1.1	1.4		2.2	
Quan 3		2.4										1.2	1.4										1.8
Quan 5					1.4	1.8							1.8		1.6								
Quan 6					2.3								2.3		2.4	3.7				1.9	1.2		
Quan 7																							
Quan 8																						1.3	1.6
Quan 11													2.4		1.6	2.3							1.7
Binh Chanh																2.1							
Binh Thanh		1.0	3.1					1.0							1.0					2.1	1.8		
Can Gio																							
Cu Chi	2.4																						
Go Vap										1.3						1.6			3.3	1.0			
Hoc Mon															2.9					3.0			
Nha Be																							
Phu Nhuan	1.9															1.3							2.6
Tan Binh					3.5		3.4	4.2					1.9		2.7	1.0				3.2			
Thu Duc			1.9				1.3	2.5			1.9		1.4				3.2					1.4	
Dong Nai Prov.			2.8	3.0		2.2	1.1																
Long An Prov.				1.7		1.6										1.3							2.6
Song Be Prov.			1.3	1.9		2.4							1.9		2.7	1.0				3.2			

**Table 7 Districts with Service Industry Employment Concentrations Greater (Standard Deviation)**

<i>Industries<sup>3</sup></i>	<i>W<sub>d</sub></i>	<i>W<sub>n</sub></i>	<i>B<sub>m</sub></i>	<i>G<sub>m</sub></i>	<i>F<sub>s</sub></i>	<i>A<sub>u</sub></i>	<i>A<sub>q</sub></i>	<i>F<sub>u</sub></i>	<i>R<sub>e</sub></i>	<i>R<sub>m</sub></i>	<i>F<sub>b</sub></i>	<i>I<sub>b</sub></i>	<i>R<sub>e</sub></i>	<i>I<sub>o</sub></i>	<i>A<sub>s</sub></i>	<i>H<sub>s</sub></i>	<i>B<sub>s</sub></i>	<i>A<sub>r</sub></i>	<i>M<sub>p</sub></i>	<i>A<sub>m</sub></i>
Quan 1	4.2	4.2		2.0	1.8	4.1	2.6	4.1		3.5	3.1	2.6		1.7		3.8	2.6		2.1	2.4
Quan 3	1.5	1.4		3.0					2.7	2.3	1.4		2.3			2.3	1.6			
Quan 4																1.2				
Quan 5				1.1	3.8						2.4					2.3			1.2	
Quan 6									1.4											
Quan 8																				
Quan 10		2.4														1.4				
Quan 11											2.7					1.1				
Binh Chanh																				
Binh Thanh		1.4							2.0									1.9		
Nha Be						1.0														
Phu Nhuan																1.8				
Tan Binh		1.7			1.7					1.1						1.1				
Thu Duc															1.7					
Dong Nai Prov.						1.0														
Long An Prov.																1.8				
Song Be Prov.		1.7			1.7					1.1						1.1				

<sup>2</sup> N=Non-Metallic Minerals, Cg=General Building Construction, Ch=Heavy Construction, Sc=Special Construction, F=Food Processing, Tp=Tobacco Products, T=Textiles, G=Apparel & Garments, W=Wood Products, Fu=Furniture & Fixtures, Pa = Paper & Allied Products, Pr=Printing & Publishing, C=Chemicals, Pe=Petroleum Products, Rp=Rubber Products, P=Plastics, L=Leather Products, B=Stone & Clay Building Products, Me=Primary Metal Industry, I=Industrial Machinery, E=Electrical Goods & Appliances, Tr=Transport Equipment, In=Instruments, M=Miscellaneous Manufactures

<sup>3</sup> Wd=Wholesale/ Durable, Wn=Wholesale/ Non-Durable, Bm=Building Materials, Gm=General Merchandise, Fs=Food Stores, Au=Automotive Dealers, Aq=Apparel Accessories, Fu=Furnishings, Re=Restaurants, Io=Investment Offices, As=Agriculture Services, H=Hotel & Lodging, Bs=Business Services, Ar=Auto Repair/ Parking, Mp=Motion Pictures, Am=Amusements & Recreation

Unlike other large cities in Asia, such as Bangkok and Manila, suburbanization of the retail and commercial sector is not yet apparent. This process will eventuate with the movement of industrial employment and the construction of new housing in outlying districts. The intensity of concentration of service industry clusters in the inner city will remain until the city begins to see a natural process of population decline as people seek employment and accommodation closer to employment areas outside the central city. Urban planning policy should continue to reinforce the growth of specialised industry clusters, such as higher education, tourism services, financial and government services in the city centre for some time to come. At the same time, provision should be made to decentralise trading, specialized training, research and development, health and community services to newly established areas of the city. This will have implications for the demand and types of infrastructure to be built in the city.

## Infrastructure Implications of Cluster Analysis

### *Implication of Industry Cluster Development for Infrastructure Development*

The key success factors associated with cluster building are leadership, networking and capacity building. All clusters require strategic infrastructure to support their development. From industry assessment, the strategic infrastructure required to support the development of industry clusters in order of priority are shown in Table 5.

**Table 5 Strategic Infrastructure Needed to Support Industry Cluster Development**

Industry Cluster	Strategic Infrastructure <sup>4</sup> needed to Support Industry Cluster Development 1 = Highest Ranked Priority															
	T	W	E	C	G	O	E	T	R	S	M	E	F	R	E	
	r	s	s	o	a		d	d	d	t	a	t	d	r	m	
Agriculture	1	3	3	3		2		2	4	1	2	2	2	3	4	
Food Processing	1	1	1	3	2	3	3	2	2	1	1	3	2		2	
Chemicals	4	1	1	3	1	2	3	2	4	2	2	4	2		1	
Garment	2	3	2	3		5	3	2		2	1	4	2		3	
Textiles and Plastics	2	1	1	3	2	2	3	2	3	3	2	4	2		1	
Tourism	1			1		2	2		2		1	2	2	2	1	
Leather Products	3	2	2	3		3	3	4		2	2	3	3		1	
Construction	1					2	1	2	3	2	3	2	2	1	2	
Education				2		1	3		1			1				
Transportation	1					1	3	2		1		4	2			
Metal Products		2	1	3	2	2	3	2	2	2	2	1	2		2	
Rubber and Plastics		1	1	3	1	2	3	2	4	2	2	4	2		1	
Wood Processed Products	3	2	1	3	2	2	3	2	2	2	2	1	2		2	
Non-Mineral Products							3	2		2	4	4	3		1	
Furniture	2		2	5			3	2			2	2	2			
Paper Products		1	1	2	2	2	3	3		2	2	3	2		1	
Printing and Publications				2		2	3	2		2	2	4	4		2	
Machinery Equipment		2	1	3	2	2	3	2	2	2	2	1	2		4	
Electronic Appliances			1	2			3	1	2	2	2	3	3		4	
Medical Instruments						2	3	1	1		2	2	2			
Cycles and Motor Cycles Vehicles	1					2	3	5	5		3	3	4		3	

<sup>4</sup> Tr=Transport Infra., Ws=Water Supply & Sewerage, Es=Electricity Supply, Co=Telecommunications, Ga=Piped Gas & Fuels, O=Other Infra., Ed=Estate Development, Td=Technology Dissemination, Rd=Research & Development, St=Storage & Transport, Ma=Business Marketing, Et=Education & Training, Fd=Financial Sector Development, Rr=Regulatory Reform, Em=Environmental Management

### *Spatial Results of the Cluster Analysis*

The spatial results of the cluster analysis are summarised in Figure 4. The dominance of the Tan Binh and Binh Chanh areas is not fully conveyed by the diagram, but a glance at Tables 4 and 5 will confirm it. Generally, the clusters identified in the previous chapter are concentrated in a number of areas. However, with the exception of the leather industry which is concentrated only in the Thu Duc area, areas of concentration tend to have several cluster industries present. Some generalisations can be made about the structure and location of industry however.

It may be seen that the Textile and Garment clusters concentrate together and generally in the northern fringe of the city, particularly in the Tan Binh and Thu Duc areas. There are clear reasons for this aside from the fact that the two industries are strongly linked in supplier-customer relations and in fact both operations may be undertaken by the same company on the same site. First, such plants are relatively land intensive and significant parcels of land are still available near main roads in this area. Second, such plants are often very labour intensive employing thousands of workers and these northern areas are relatively well linked to the labour pool in the inner districts of HCMC. Third, the textiles plants, and to a lesser degree the garment plants are likely to have significant suppliers in the Bien Hoa bulk chemicals cluster just north on QL1. Fourth, some textile and garment exports will be dispatched through Vung Tao ports and this location will minimise transport costs - however, due to existing infrastructure arrangements, most containerised cargo is likely to be dispatched via the Sai Gon port complex.

The food processing cluster concentrates on the fringe of the city where access to agricultural produce is maximised. Mostly this access is by road - in the Tan Binh area especially - but in the Binh Chanh and the (relatively central) Quan 6/11 areas canal access for fish and agricultural produce from the Mekong is significant (see economic study for Tau Hu). While less land and labour intensive than textiles and garments such factories (canneries etc.) generally employ hundreds and require the same good access for employees. Most food processing is not for export but access to national markets is important and thus access to the national highway network is important. For this reason location on or near QL1 is an advantage and the concentration areas show this location preference.

Interestingly, while the chemicals cluster is present in several of the concentration areas, it is focused on the Quan 6/11 area. This suggests two things. First, that the type of chemicals industries being captured in the statistics used are not the huge bulk chemicals plants of the Bien Hoa area, but smaller scale 'boutique' chemicals and warehousing/ retail outlets. Second, that there is present, in a relatively central district with inadequate waste treatment infrastructure, an industry which poses a significant public health hazard. Important to these small and medium scale industries are supplier links - and most inputs will be imported through the Sai Gon port complex - and access to customers - and Quan 6/11 is close to population centres for retail activity.

Comparable to food processing in their labour and space requirements are the light manufacturing cluster industries and consequently they concentrate in approximately the same areas, although there may be a tendency for them to be located somewhat further out from the city centre. These industries vary from metal working through wood and rubber products to electronic assembly (although with better data it may be possible to distinguish narrower cluster industries, such as an electronics cluster, at present it is not possible to do so). While capital equipment will have to be imported through the Sai Gon ports, there are two clear distinctions between such enterprises. Where their market is national, these industries need access to the national highway system. Where their market is overseas - and the export processing zones are predominantly light manufacturing (not textiles and

garments) they need access to ports. Suppliers are either agricultural based or bulk metals sourced from HCMC (such as the Thu Duc Steel Mill) or from the heavy manufacturing complex in the Hanoi- Hai Phong area. In either case, access to QL1 is essential and to the Reunification Railway (the national north-south line) desirable. Again, all concentration areas exhibit these location characteristics.

The tourism cluster exhibits, as would be expected, very different characteristics, concentrating in the Quan 3 and Quan 1 areas. Located within these areas, mainly in the corridor between the airport and the CBD and constituting the main international access and main area of tourism interest, the cluster is slightly differentiated by type of tourist - with Quan 10 being the 'backpacker' area and Quan 5 a major centre for local hotels.

## **Strategic Priorities for Infrastructure**

An Analysis of infrastructure was undertaken for each cluster involving research and discussions with industry representatives. The overall economic strategy for development of the identified clusters was set out in Section 2.2.4 above. This strategic direction needs to be interpreted in terms of actions required to facilitate the expansion of industry within these clusters. Such actions fall into two categories - macro issues of industry and land policy and micro-level interventions including infrastructure provision. Both of these sets of actions need to be undertaken for the overall economic strategy to be successfully implemented.

### ***Macro Issues***

While outside the scope of this exercise, it is necessary to briefly review the influence of macro-level policies on the efficient conduct of an urban economy. In HCMC, there are two essential areas of reform.

The first area of reform is the equitization of state enterprises and the separation of these enterprises from government regulatory and planning activities. Without such separation, there is little incentive and often no actual administrative mechanism to maximise the use of resources of the enterprises concerned on the part of the managers of those enterprises, nor to charge the enterprises fairly for the public resources they consume. There is no incentive, for example, to move land intensive low value-added economic activities (such as the sand depot in District 5) to a more appropriate location if the manager of the state enterprise concerned cannot buy/ lease more suitable land, cannot sell the land/ right to use the land and does not have to pay property tax proportionate to the opportunity cost of the land.

The second area of reform is implicit in the above - reform of the land administration system. This constitutes a significant transaction cost within the economy, requiring many resources and time to accomplish legally - where that is possible - and significant resources and time together with an 'uncertainty premium' of continuing bribes and short payback periods (higher required rates of return on investment) where it is accomplished illegally.

### ***Micro Issues***

By no means all the micro-level interventions required to support the growth and development of clusters concern infrastructure. Nevertheless in this document, infrastructure is the focus of the analysis. In respect of other sorts of interventions - such as those designed to facilitate access to market or technical information, or those which foster access to required finance for investment - these can sometimes be 'bundled' together with infrastructure provision and this is a point to which we will return below.

Given the export orientation of the textile and garment clusters, the overwhelming strategic priority is to provide access to export ports and to ensure that orders placed can be filled on time and to the required standards. Thus the quality of the roads to ports and the efficiency



and equipment of the ports themselves are important. In order to minimise shipping costs vessels of at least 20,000 dead weight tone (dwt) (1000 Twenty Foot Equivalent Unit (TEU) need to have access and adequate port container capacity needs to be available to load exports. This is currently not the case in the Sai Gon port complex. Roads to the port are congested and travel times are long. While adequate land remains in the northern fringe of the city, getting access to it is not always a straight forward process (i.e. asking someone to sell/ sell the use right). Further, industry dependent on the national electricity grid has production interrupted by brown-outs/ supply disruptions - particularly in the Tan Binh and Thu Duc areas? Generators are an expensive and inconvenient way to ensure continued production. These infrastructure-based deficiencies need to be overcome. These industries are also significant producers of polluted waste water. Many factories discharge pollutants into drains and/or water sources. Current scattered locations of the factories, as well as their inter-dispersal with plants producing waste water of very different characteristics (such as food processing), make centralised treatment of the waste water difficult. Thus, while fostering the development, and concentration, of these clusters in the northern quadrant of the city is appropriate, a more co-ordinated approach to on-site infrastructure provision is required.

Encouraging the further development of the food processing cluster in the south-west fringe of the city, where access to agricultural produce is maximised, also seems to be efficient. Encouraging export activity on the part of this cluster is important and better access to the Sai Gon port complex and the facilities there is also important. The same argument in respect of electricity and waste water treatment applies to these industries, but the quality and quantity of water used is often even more important. Large quantities of water are used for input into the products and for heating, cooling and washing both the products and the factory to maintain hygiene levels. Water is however a major problem in this area. Facilities for perishable processed food are not adequate at the ports and, in certain food supply chains; access to the airport is also required (although this is unlikely to be needed for the moment).

Given space constraints, access constraints and potential environmental hazards of location in the Quan 6/11 area and the increasing concentration of the chemicals/ plastics industries in the Bien Hoa area - making use of gas and petroleum feedstock from the Vung Tao area - it is highly questionable if a chemicals cluster is viable in the HCMC city area - with the possible exception of Thu Doc - given existing locational and infrastructure orientation. If any economies of scale are to be gained while retaining access to HCMC consumers and companies utilising the products of this industry as inputs - the light manufacturing cluster for example - while improving environmental conditions, significant infrastructure investment will be required. Given its stated orientation and location, the industrial estate at Hiep Phouc is the logical place to develop such an industry which would then potentially have access to a dedicated port in the area (although the only existing ports are a small cement port and a local government port - also small). More detailed analysis would be required to determine if such investment was warranted given the competition from the Bien Hoa - Phu My - Vung Tao corridor.

The light manufacturing cluster industries are actually easier to accommodate than most of the above, usually with modest space, road access, waste disposal and water requirements. Even electrical disruption is less disruptive than in the clusters nominated above - except for the higher-value added electrical goods assembly. In general, these factories can 'fit in' among others, their requirements being less than those of other clusters and their impact also being less. However, as discussed above, some specialisation within this broad cluster is desirable from the viewpoint of increasing industry efficiency. Although statistics are not good enough to confirm the trends, there appear to be wood processing clusters developing in Go Vap/ Binh Thanh area and rubber products in the Bin Chanh area. Electronics seem to be spread between these areas and in the export processing zones. Linking these

industries with more efficient ports and with the national market will be important. Further, access to the airport may be important for certain 'just in time' deliveries.

The tourism cluster requires upgraded airport facilities, whereas hotels (especially given low levels of occupancy currently seen) are adequate. Taxis and other transport are adequate although more of it could be English-capable. The problem for the moment is on the demand side - both because of the difficulty in accessing tourism sights outside HCMC and because of the exchange rate differential with, say, Thailand, which has a much better developed tourism infrastructure.

### *Overview of Infrastructure Strategy*

The priorities of the strategy, shown in Figure 4, may be summarised as:

- increasing efficiency of access of export industries to export markets by increasing outer and inner ring road access to, and efficiency of, ports;
- facilitating efficient production by the provision of infrastructure geared to the cluster in question;
- minimising environmental impact of production by the provision of infrastructure geared to the cluster in question;
- minimising labour costs and access to the suppliers of producer services (which for the foreseeable future will be located in the CBD) by facilitating ease of movement across the city for labour (not for goods which will be forced to use the ring roads in general) by creating an efficient long haul public transport system on radials and ring road and encouraging private operators to service concentrated employment areas from stops on the trunk routes (this has to be combined with effective central city traffic management action); and
- Minimising labour costs by enabling the establishment of housing areas - providing appropriate infrastructure for affordable housing - near industrial estates.
- The main institutional constraints to implementation of this strategy are respectively:
- failure to co-ordinate road activity (including rationalising already approved schemes which conflict with the strategy), insufficient relocation capacity and budget for roads and difficulty in prioritising and funding port investments;
- lack of capacity, legislative backup and co-ordination; lack of marketing capacity and under-capitalisation of developers in the industrial estate sector to allow consolidation of clusters and the provision of infrastructure geared to the cluster in question;
- similar lack of capacity, legislative basis and co-ordination together with under-capitalisation of developers to enable provision of infrastructure to minimise environmental impact of production;
- lack of capacity for co-ordination of traffic management initiatives and public transport investments - which are inter-dependent - in order to achieve acceptable alternatives to motor cycle travel; and
- inflexibility of the land development process - now in the hands of parastatals - to respond to demand and thus minimise labour costs by enabling the establishment of housing areas near industrial estates.

### *Detail of Strategy*

For the textile and garment clusters, the expansion of the outer ring and its extension to South Saigon and west to the Sai Gon River and its port complex is the highest road investment priority. The construction of the north-western section of the inner ring linking to QF1 in the north, cutting below the airport and linking to the outer ring in South Saigon is also a high priority. Radial development - except to facilitate public transport usage - should be discouraged as this will continue to allow companies in the central districts to get products to the ring roads. Development of the eastern portion of the inner ring road is not required and the southern portion is a low priority. Upgrading of Sai Gon port complex and dredging to routinely accommodate 20,000 dwt vessels and port container facilities is essential in the

short term. Urgent consideration should be given to extending the port facilities at Tan Thuan for use by companies other than those in the Export Processing Zone (EPZ). Given the eventual development of industry to the north of the city and its links to, and need for ports in, the Bien Hoa - Vung Tao corridor, augmentation of the access to the Cat Lai port may be desirable and would constitute (albeit involving a ferry) a more direct route to the southern part of the corridor - linking directly to Phu My. Existing industrial estates/ EPZs in Tan Binh, Binh Thanh and Thu Doc need to be focused to provide services to these industries. This activity may involve substantial recapitalisation and restructuring of existing developers. If necessary, a dedicated power source as used in the Tan Thuan EPZ (which uses the Hiep Phuoc plant) should be commissioned to achieve reliable power supplies.

Encouraging the further development of the food processing cluster in the south-west fringe of the city, will utilise the same sets of investments as discussed above, especially in respect of that part of the cluster which is involved in export. Urgent to facilitate supplies from the Mekong area is the completion of the new river port at Phu Dinh and its linkage to the outer ring road. As noted above, the existing industrial estates in the Binh Chanh area need to be focused to provide services to these industries. Urgent attention also needs to be given to supply of the quality and quantity of water required by these industries. If required to address potential markets - further detailed analysis of the cluster is required to determine this - facilities for perishable processed food should be established in the Sai Gon port complex.

If more detailed analysis showed that the establishment of a chemicals/ plastics cluster was warranted given the competition from the Bien Hoa - Phu My - Vung Tao corridor, upgrading of the road link between South Saigon (the southern part of the outer ring road) and Hiep Phuoc is a priority as is the further development of the industrial estate.

As discussed above, the light manufacturing cluster industries require the same infrastructure in the same places as the above industries. Further investigations are required to determine whether more focused infrastructure and support are required for the wood processing clusters in Go Vap/ Binh Thanh area, rubber products in the Bin Chanh area and electronics in both these areas and in the export processing zones. Upgrading of airport cargo facilities is also desirable.

The tourism cluster requires upgraded airport facilities and better traffic management in order to facilitate travel around the city and avoid inevitable accidents involving tourists who do not understand the Vietnamese traffic 'system'. Security for tourists could also be improved.

Underpinning these investments are extensive investments in public transport - specifically unobstructed bus (and maybe taxi) priority lanes on radials and rings served by quality buses at short intervals. Better traffic management is essential for such a system to work. The alternative, and probably unaffordable, option is a metro on the same routes. It is also essential that high density housing be encouraged along these routes to maximise usage and thus revenue. This will, in turn, minimise the subsidy required for public transport. Consideration should be given to allowing land development rights for the investment in buses and construction of such a network.

### ***Priority Projects and Budgets***

Specific ring road, port, airport, industrial estate, water and transport investments identified in sectoral investment plans conform to the detail strategy set out above. Aggregating these projects, the base priority programme would cost some \$3.5 billion. This was a much more realistic figure than the \$10 billion 'wish list' compiled by a plethora of agencies. The programme identified is nevertheless large in respect of the city investment budget (see Table 6 below).

**Table 6 City Capital Budget 1996 (US\$ million)**

Sector	Capital Expenditure			Total Expenditure
	Own Resources	City/ Districts	ODA	
Transport				13.95
Water Supply		4.31	0.85	5.15
Housing	43.82	3.05		46.88
Solid Waste	0.77	9.59		10.36
Drainage				not available
Total				70.27
				226.46

The capital budgets are difficult to obtain and may be inaccurate. However, in terms of orders of magnitude, they are instructive when set against the programmes identified by the sectoral agencies and, indeed by the process undertaken above. The list of priority projects as derived from the project priority lists for the sectoral agencies totals \$3.5 billion. The basic programme in each sector may be achievable IF the departments concerned can mobilise resources from aid or the private sector in the order of 10 times local inputs. This is difficult.

However, this situation need not deter the pursuit of the identified investments when strategic objectives are clear - improve the ring roads, for example. Ways should be sought to:

- Mobilise additional funds - by linking road improvement with industrial development and attracting private sector finance, for example; and
- Minimise expenditure for maximum impact on the objective - by widening roads which constitute an alternative to (near the proposed alignment of) the inner ring road, for example.
- The existing governmental apparatus is somewhat weak in the co-ordination and creative inter-disciplinary design required to find these interim solutions. A comprehensive approach to upgrading the skills required to undertake such activities - to institutionalise the MSIP process - is required.
- It will entail focus and a careful assessment of the quality and quantity of counterpart private sector resources and careful prioritisation and attention to detail in formulating ODA projects.

## Conclusion of the Analysis

The absence of good data for analysis and planning in developing countries is always a problem. Ho Chi Minh City is more fortunate than most in Asia to have had data on telephone connections to industries by industry type and employment for most businesses. This information has enabled the authors of the paper to test and develop the application of cluster industry analysis for the provision of strategic infrastructure in the city. The results of the analysis were able to show which industry sectors were of critical importance to the economy of the city and the spatial location of these. Using Goals and Achievement Matrix and multi sector analysis techniques, it was possible to determine priority projects and the spatial demand for infrastructure to support the development of industry clusters. A

comprehensive strategy is now needed to progressively develop key infrastructure to support emerging industry clusters in the city.

The methodology used for the analysis requires augmentation in the following areas. There needs to be better quantification of supplier and customer linkages - through more structured survey and possibly dis-aggregated input-output tables. Secondly, there needs to be better quantification of infrastructure impacts on supplier and customer linkages and on the core industry in question - also possible using the above techniques. However, as the reviews conducted above demonstrated, the technique has utility in providing a more solid basis for the management of infrastructure investment programmes even if applied in its basic form, utilising qualitative assessments.

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Figure 4

