Labor is an important resource in economic development of provinces and cities. The forecast of labor demand will help the Government and agencies map out proper policies to meet their development requirements and help the workers find their job orientations and targets. There are a lot of methods to forecast the labor demand, this article forecasts the labor demand in HCMC in terms of quantity by Cobb-Douglas function and the 2000 Input-Output datasheet.

1. Production function of each industry

The HCMC labor demand by the year 2010 is forecast on the basis of Cobb-Douglas function of 12 economic sectors whose data are annually updated in the city statistical yearbook. These twelve sectors are summarized from 20 first-level economic sectors for convenience in use, reference and update. The production function based on the assumption of output constant to scale is given by:

$$Q = AK^{\alpha}L^{1-\alpha}$$

Where: Q is GDP (base price); K capital (base price); L labor.

α is constant coefficient or production surplus ratio in value added calculated from HCMC input-output datasheet in 2000. This coefficient is assumed constant during the 2001-2010 period.

A is coefficient of technical advance. This coefficient in 2000 is calculated from the figures of Q, K, L and α.

The above table indicates the values of variables and constants in the production function of each industry in 2000, for example, for agriculture and forestry, the production function is given by

$$GDP = 3.57 \, K^{0.45}L^{0.55}$$

2. Capital and average wages of each industry

To estimate the labor demand of each industry, we assume that production units in the industry minimize their capital and labor provided they satisfy the production

Forecast of labor demand in HCMC by 2010

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Table 1: Values of constants and variables of production function for 12 sectors of HCMC in 2000

Industry	GDP	K	L	α	1-α	A
Unit	VND mil.	VND mil.	Person			
Agro-forestry	994,000	271,131.82	133,902	0.458	0.542	5.372
Fisheries	160,000	82,344.45	8,189	0.525	0.475	5.822
Mining	28,000	264,567.35	3,238	0.214	0.786	3.365
Manufacturing	18,974,000	47,006,417.67	749,559	0.265	0.735	8.458
Electricity and water production and supply	1,065,000	6,615,489.17	13,063	0.127	0.873	36.911
Construction	3,246,000	10,793,687.87	151,382	0.181	0.819	9.925
Trade	7,722,000	24,360,714.244	34,353	0.291	0.709	5.502
Hotel and restaurant	3,315,000	5,324,167.07	154,816	0.210	0.790	10.191
Transport, warehousing, post	4,809,000	7,406,320.46	184,071	0.207	0.793	12.162
Finance, banking	1,733,000	34,543,887.79	9,585	0.807	0.193	0.243
Real estate	2,704,000	13,048,925.61	32,285	0.236	0.764	20.368
Other services	8,004,000	2,367,644.85	335,425	0.068	0.932	20.874

Source: GDP (base price) is extracted from the statistical yearbook; capital (K) is figured out by the author; labor (L) is also extracted from the statistical yearbook.

equation:

The cost function on capital and labor is given by:

$$C = rK + wL$$

Where:

C is total cost; r is the percentage

Table 2: Capital cost, average wage and w/r of HCMC in 2000

Industry	Income (VNDmil.)	Production surplus + depreciation (VNDmil.)	K (VND mil.)	L (person)	W	r	w/r
Agro-forestry	544,017	580,862	271,132	133,902	4.06	2.14	1.90
Fisheries	47,520	75,647	82,344	8,189	5.80	0.92	6.32
Mining	13,661	11,907	264,567	3,238	4.22	0.05	93.74
Manufacturing	11,664,174	11,194,650	47,006,418	749,559	15.56	0.24	65.34
Electricity and water production and supply	1,117,177	336,710	6,615,489	13,063	85.52	0.05	1680.29
Construction	2,909,012	1,322,068	10,793,688	151,382	19.22	0.12	156.89
Trade	4,242,076	4,428,341	24,360,714	434,353	9.77	0.18	53.73
Hotel and restaurant	2,120,747	1,601,573	5,324,167	154,816	13.70	0.30	45.54
Transport, warehousing, post	3,206,022	2,606,234	7,406,320	184,071	17.42	0.35	49.50
Finance, banking	304,540	2,076,952	34,543,888	9,585	31.77	0.06	528.44
Real estate	1,888,433	1,138,877	13,048,926	32,285	58.49	0.09	670.19
Other services	9,134,893	1,900,595	2,367,645	335,425	27.23	0.80	33.93

Source: The author's calculation.

of capital cost of each industry or the ratio between the production surplus and depreciation from total capital; w is the industry's average wage, or the ratio between the industry's payroll and total workers.

Income, production surplus and depreciation are figured out from HCMC 2000 input-output datasheet. K (current price) is estimated from the data "Capital based on 1994 price" (VND55,924 billion provided by the HCMC Statistics Bureau to the Master Plan for the Southern Focal Economic Zone) and development investment capital in the 1994-2000 period (the development investment capital in 1995-1999 is estimated upon the assumption that the growth rate of development investment is equal to that of capital construction investment). HCMC capital in 2000 after estimated will be allocated to industries in proportion to businesses' capital in industries in 2000 (Source: HCMC Statistics Bureau). The capital will be changed into base price.

Each industry minimizes its cost $(C = rK + wL \rightarrow min)$ upon condition that

Using Lagrange method, we will deduce the following formula (*):

$$\rightarrow L = \frac{Q}{Ax\left(\dfrac{\alpha}{1-\alpha}\right)^{\alpha} x\left(\dfrac{w}{r}\right)^{a}} \quad (*)$$

The formula (*) is used to forecast the labor demand (L) of industries. Therefore, we must have Q, A, w/r and of the forecast year. We have estimated these indicators for each industry in 2000. is assumed constant in the 2000-2010 period. We continue estimating values of Q, A, w/r for the 2001 – 2010 period.

3. Estimating the values of variables in the formula (*) for each year in the 2001-2010 period

+ Estimating Q (GDP) of each industry by 2010.

In this article, the author uses the low plan (1) in the GDP growth scenario of HCMC by 2010, then

estimates the city GDP for each industry in each year in the 2001-2010 period; so the GDP of 2005 and 2010 is indicated in Table 3:

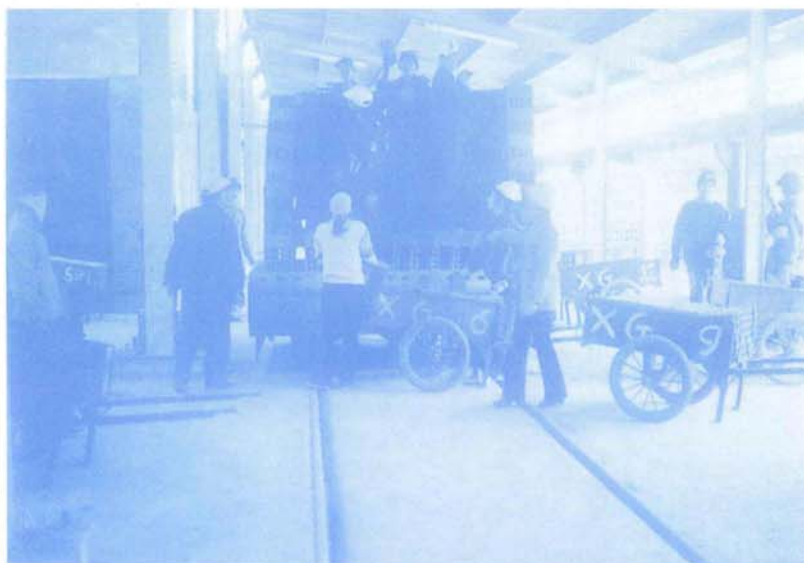**Table 3: Estimates of GDP (1994 base price) by 2010 (VND mil.)**

Industry	2005	2010
Agro-forestry	1,082,004	1,195,924
Fisheries	386,498	1,079,190
Mining	36.9715	1,265
Manufacturing	40,189,306	96,473,226
Electricity and water production and supply	1,973,798	4,060,801
Construction	4,249,510	5,833,635
Trade	9,624,942	12,474,315
Hotel and restaurant	4,614,389	6,805,636
Transport, warehousing, post	8,475,784	16,451,490
Finance, banking	5,458,038	20,641,899
Real estate	4,615,604	8,632,338
Other services	11,508,268	17,627,676

Source: The author's calculation

+ Estimating A and w/r of each industry by 2010

HCMC Economic Institute has estimated the growth rate of A coefficient is 2.5% for the 2001-2005 period, and 3% for the 2006-2010 period, the growth rate of w/r is 10% for the 2001-2005 period and 12% for the 2005-2010 period. (2)

From these data, we easily figure out Q, A, w/r and from 2001 to 2010 of each industry. Thereby, the labor demand for each industry in each year of the 2001-2010 by the formula (*) is indicated in Table 4.

The above table shows us the forecast of labor demand of HCMC by 2010. This is the number of workers required for the city industrialization and modernization. In addition, if mentioning the labor demand of industrial parks and export processing zones alone, these areas require 25,300 workers by 2005 and 126,500 by 2010.

As a result, the labor demand of HCMC for its development targets by 2010 is very large and growing fast. Nevertheless, the city faced high unemployment rate in recent years

(6.13% in urban areas in 2004 and 6.4% in 2003, highest as compared to the southeastern provinces, Đà Nẵng and Cần Thơ). This reveals the city's labor quality and transaction methods in the labor market should be improved and those workers who wish to find a job in the city must be highly skilled ■

Table 4: Labor demand of each industry in HCMC by 2010 (Thousand persons)

Industry	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Agro-forestry	141.51	134.42	127.68	121.28	115.20	108.34	101.88	95.80	90.09	84.72
Fisheries	10.99	12.16	13.47	14.91	16.50	18.54	20.83	23.40	26.29	29.53
Mining	4.20	4.24	4.29	4.33	4.38	4.43	4.48	4.53	4.58	4.64
Manufacturing	1,074.00	1,187.15	1,312.22	1,450.47	1,603.28	1,799.68	2,020.13	2,267.58	2,545.35	2,857.15
Electricity and water production and supply	15.62	17.04	18.58	20.26	22.09	24.42	27.00	29.84	32.99	36.47
Construction	174.60	176.71	178.83	180.99	183.17	185.63	188.13	190.65	193.21	195.81
Trade	565.10	560.37	555.69	551.04	546.44	540.62	534.86	529.17	523.54	517.96
Hotel and restaurant	196.96	201.23	205.59	210.05	214.60	219.90	225.32	230.88	236.58	242.41
Transport, warehousing, post	249.49	267.29	286.36	306.80	328.69	355.93	385.44	417.38	451.98	489.44
Finance, banking	16.16	18.36	20.86	23.71	26.94	31.14	36.00	41.62	48.12	55.63
Real estate	40.15	42.62	45.25	48.04	51.00	54.64	58.54	62.72	67.19	71.99
Other services	375.42	391.29	407.84	425.08	443.05	464.82	487.65	511.61	536.75	563.12
Total	2,864.18	3,012.87	3,176.65	3,356.94	3,555.34	3,808.08	4,090.25	4,405.20	4,756.67	5,148.87

Source: The author's calculation