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FORECASTING OF FOREIGN LABOR DEMAND IN MALAYSIA'S CONSTRUCTION SECTOR

This article aims to estimate the need for foreign labor in Malaysia's construction sector by 2020. The analysis is based on the Survey of Construction Industry's data, supplied by the data of the Department of Statistics, Malaysia. The results show that out of total foreign labour demand in 2020 the breakdown is as follows: 66.0% are general workers, 18.6% are technical personnel and 15.4% are professional workers. However, from 2010 to 2020, the percentage increase in the needs for foreign professional workers is higher than for technical staff.

Keywords: *foreign labor; professional workers; technical workers; construction sector; Malaysia.*
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ПРОГНОЗУВАННЯ ПОПИТУ НА ІНОЗЕМНУ РОБОЧУ СИЛУ: НА ПРИКЛАДІ ГАЛУЗІ БУДІВНИЦТВА МАЛАЙЗІЇ

У статті зроблено спробу оцінити потреби в іноземній робочій силі будівничого сектору Малайзії та спрогнозувати цю потребу до 2020 року. Аналіз та прогнозування здійснено з використанням даних галузевого опитування, проведеного Департаментом статистики Малайзії. Результати вказують на те, що в 2020 р. попит на іноземну робочу силу в цій галузі розподілиться таким чином: 66% – різноробочі, 18,6% – технічний персонал та 15,4% – професіонали вузької спеціалізації. При цьому протягом декади з 2010 р. по 2020 р. попит на вузьку спеціалізацію буде зростати швидше, ніж на технічний персонал.

Ключові слова: *іноземна робоча сила; професіонали вузької спеціалізації; технічні робітники; сектор будівництва; Малайзія.*
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ПРОГНОЗИРОВАНИЕ СПРОСА НА ИНОСТРАННУЮ РАБОЧУЮ СИЛУ: НА ПРИМЕРЕ СТРОИТЕЛЬНОГО СЕКТОРА МАЛАЙЗИИ

В статье сделана попытка оценить потребность в иностранной рабочей силе строительного сектора Малайзии и спрогнозировать эту потребность до 2020 года. Анализ и прогнозирование осуществлены с использованием данных отраслевого опроса, проведённого Департаментом статистистики Малайзии. Результаты указывают на то, что в 2020 г. спрос на иностранную рабочую силу в данной отрасли разделится следующим образом: 66% – разнорабочие, 18,6% – технический персонал и 15,4% – профессионалы узкой специализации. При этом в течение декады с 2010 г. по 2020 г. спрос на узкоспециализированный персонал будет расти быстрее, чем на технический.

Ключевые слова: *иностранная рабочая сила; профессионалы узкой специализации; технические работники; сектор строительства; Малайзия.*

Introduction. The forecast on skill needs is an important issue in HR planning. D.J. Bartholomew and A.F. Forbes (1979) defined human resources planning as an effort to match labor supply and job opportunity; and this is usually accomplished by the goverment, may it be at national or regional level. Human resources planning is

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also referred to as an effort to provide sufficient labor supply in accordance to their qualifications in executing certain jobs (Abegaz, 1994). The importance of forecasting is that it provides an illustration of job opportunity according to job demand, in line with country's economic growth. This opinion is supported by G. Psacharopoulos (1985). Labor demand estimate is important in ensuring the continuity of production activities (Spalletti, 2008).

The need for new workforce depends on the growth of a sector. Malaysia's construction sector is not an exception as this sector has been experiencing rapid growth, especially in the past few decades; and this has resulted in an increased need for additional workforce. Nonetheless, large jobs opportunity in the construction sector has failed to attract local workers as it is categorised as dirty, dangerous and difficult (3D) jobs. Less-attractive environment of the construction industry has caused high demand for workers that cannot be fulfilled by local workforce and thus creates the dependency on foreign labor. The government has taken few steps in empowering the construction sector's jobs as well as short- and long-term efforts to reduce dependency on foreign workers.

Malaysia's labor market has achieved full employment with unemployment rate of only 3.1% in 2014. Overall, foreign laborers make up 15.4% of total labor in this country. The number of legal foreign labor working in Malaysia exceeded 2.2 mln; but only 2.4% of them are high-skilled expatriates (Ministry of Affairs Malaysia, 2015). In 2003 to 2005, there was a slump in the trend of contruction sector's labor. According to the Ministry of Human Resource, employment in the construction sector in 2003 was 774,600 workers and the reduction in 2004 was 7,300. This decline then continued and reached the total of 759,600 workers in 2005. Nonetheless, after the 2008 economic crisis, the construction sector's number of labor has shown an improvement. In 2009, the number of workers was alrealdy 762,400 and increased to 765,500 in the subsequent year. The increase remained and there were alrealdy 768,000 workers in 2011. According to the Economic Census 2011, non-residential subsector contributed the highest number of labor at 285,695 (29.3%), followed by civil engineering at 251,793 (25.8%), residential at 223,163 (22.9%) and special construction activities subsector at 213,837 (22.0%) (Construction Economic Survey, 2012).

Literature review. Generally, the demand for labor is a similar concept to the demand for goods. This concept explains the inverse relationship between factor price, i.e. wage rate, and labor demand (Othman, 2003). In other words, the demand for labor to produce certain level of output depends on the wage level. Besides that, prices of other inputs, i.e. economic growth and changes in economic structure also influence the demand for labor (Abegaz, 1994). The growth of economic sector that is labor intensive will increase the demand for labor input. When the sector is experiencing a shift from being labor intensive to capital intensive and increase in technological usage to speed up production process, the composition of labor and the patterns of labor demand will change. Similar factors also affect the demand for foreign labor.

According to L. Okkerse (2008), the theoretical aspect of labor market for migration can be explained by using the neoclassical model of labor supply and demand. Foreign workers can be the substitutes or complements to local workers.

Moreover, the effects of entry of foreign workers will increase labor supply in a country and this will create downward pressure on wage rate. If foreign workers have different level of skills and similar to most local workers, then this situation will also give downward pressure on their wage rate. The study of J.P. Denew and K.F. Zimermann (1994) utilised foreign workers of each industry as explanatory variable in their wage or income model for German and Austria by using time series data for the years 1984–1989. The results showed that foreign workers were substitutes to local workers. Besides that, the overall result showed that a 1% increase in the number of foreign workers will result in a decrease of more than 4% in hourly income or wages. This shows that the impact on local workers' wages is highly significant.

The study on labor demand is often extended to its future needs by employing the elasticity value of labor-output. There are various methods to project future labor requirement. One of the popular methods is the input-output model using the Input-Output Table. However, the weakness of this method is its assumption of constant labor-output ratio throughout the projection period. This method is also unable to test statistical validity. However, its advantage is that it accounts the scenario of all sectors in an economy in a view that there are interrelationship of various sectors through foreward and backward linkages. Another forecasting method often used by researchers is econometric modelling. This method is said to be able to smooth the weaknesses of the input-output model, especially in terms of checking the model fitness as it involves statistical analysis. This method dominates in the studies related to human resource as it is used more comprehensively by economists, human resource planners and policy makers (Hopkins, 2002; Wong et al., 2007).

J.M. Wong et al. (2007) in their study to project workforce in Hong Kong's construction sector had utilised the econometric model to detect the presence of long-term relationship between aggregate labor demand and several other economic variables such as construction sector's output, wage, price of construction material, interest rate and labor productivity. The Johansen's cointegration analysis and Granger-causality test were used to observe the long-term co-integration relationship of labor demand and the importance of variables' historical value in estimating future labor force demand. Vector Error Correction Model (VECM) was employed to estimate the future needs of the sector's labor demand. The results explained that output and labor productivity have highly significant relationship with construction sector's long-term labor demand as compared to interest rate, wage and construction material price.

R. Ismail et al. (2012) conducted the analysis of labor requirement in 6 Malaysia's services subsectors using econometric modelling. The results showed that output was positive and significant in affecting the demand for professional and technical laborers in 2010–2015. A.H. Halimahtun Saadiah et al. (2012) also conducted an analysis of labor requirements in the same sector to observe the trend of manpower needs. The projection was done by utilising the input-output framework adjusting it to 12 services subsectors. The result showed that the demand for labor was high in the service subsector.

Problem statement and research objective.

Problem statement. Placement of foreign workers especially in the construction sector to ease the sector's operation has somewhat caused concern. Even though there is a need for foreign skills in the construction sector, monitoring must take

precedence. Influx of foreign nationals may brought negative future implications to the growth of this industry. Lack of government monitoring over the entry of foreign workers has caused these workers taking advantage by overstaying in Malaysia. Moreover, this dependency on foreign labor has also resulted in becoming less sensitive to security and health issues (CIDB, 2005). From 1993 to 2003, the number of accidents reported exceeded 4,000 cases per year. It has been becoming a challlenge for this country's construction industry to improve its image as a career choice as well as reducing the dependency on foreign labor.

Malaysia's construction sector is still practicing labor intensive construction methods. Thus, the use of labor in this industry is increasing in accordance to this sector's growth spur. Construction recorded its highest growth in 2012 at 18.5%, as compared to 4.6% during the previous year. The growth of this sector is stimulated by several mega construction projects (CIDB, 2012). The demand for labor has also increased so that to ensure these mega projects can be completed within the stipulated timeframe. In 2011, out of 1.6 mln foreign labor, 223,688 (or 14.2%) worked in the construction sector, which was the third largest group (Department of Statistics Malaysia, 2014). Information on future foreign labor needs is particularly important for the government to design proper training programmes to lessen the dependency on foreign labor.

Research objective. The main objective of this article is to forecast the need for foreign labor by the construction sebsectors in Malaysia by the year 2020. This study utilises the data of Construction Industrial Survey from the Department of Statistics (DOS) Malaysia. The data covers 4 construction subsectors, namely, residential building, non-residential building, civil engineering and special construction activities, at 3-digit Malaysian Standard Industrial Classification (MSIC). Foreign workers are divided into 3 categories to include professional, technical and general workers. However, there are no segregation between foreign and local workers for workers who are hired directly by employers and this data is excluded from the analysis. The demand for foreign labor models are estimated by adopting the Seemingly Unrelated Regression (SUR) approach using the STATA software. The elasticities of labor demand-output obtained from this estimation are then used in projecting foreign labor requirement.

Model specification. The Cobb-Douglass production function with 3 inputs, capital, local labor and foreign labor can be written as follows:

$$Q_t = AK_t^{\alpha} Ln_t^{\beta} Lm_t^{\delta}, \quad (1)$$

where Q is the output; A is the parameter that depicts technological level used in production process. Variables K, L, Ln and Lm are the values of capital stock, the number of local labor and number of foreign labor, respectively. Meanwhile, α, β and δ are the parameters to be estimated.

The total cost spent in a production process can be written as follows:

$$C_t = rK_t + wnLn_t + wmLm_t, \quad (2)$$

where C is the total cost; r, wn and wm are the prices of capital stock, local labor wage and foreign labor wage, respectively. Firm will minimize its total cost subject to level of production and using Langrange multiplier ($\mathcal{K}$) this expression can be written as follows:

$$\mathcal{L} = rK_t + wnLn_t + wmLm_t + \lambda\{Q_t - f(K_t, Ln_t, Lm_t)\}. \quad (3)$$

Differentiate equation (3) with respect to inputs and output, we obtain the input demand function, namely, capital, local labor and foreign labor as follows:

$$K(t) = f(wn, wm, r, Q); \quad (4)$$

$$Ln(t) = f(wn, wm, r, Q); \quad (5)$$

$$Lm(t) = f(wn, wm, r, Q). \quad (6)$$

In this study foreign laborers are grouped into 3 categories, namely, professional, technical and general workers. Further, with the assumption that wages of local and foreign laborers are similar, the demand functions for foreign laborers are as follows:

$$Ld_{PA}(t) = f(w_P, w_T, w_G, va); \quad (7)$$

$$Ld_{TA}(t) = f(w_P, w_T, w_G, va); \quad (8)$$

$$Ld_{GA}(t) = f(w_P, w_T, w_G, va). \quad (9)$$

The real value added (va) is used to replace the real output (Q), as it is a better measure of output because the intermediate input is excluded. Estimation equations can be developed from equations (7)–(9) and written as follows:

$$\ln Ld_{PA}(t) = \beta_{01} + \beta_{11}\ln w_P(t) + \beta_{21}\ln w_T(t) + \beta_{31}\ln w_G(t) + \beta_{41}\ln va(t) + \mu_{01}; \quad (10)$$

$$\ln Ld_{TA}(t) = \beta_{02} + \beta_{12}\ln w_P(t) + \beta_{22}\ln w_T(t) + \beta_{32}\ln w_G(t) + \beta_{42}\ln va(t) + \mu_{02}; \quad (11)$$

$$\ln Ld_{GA}(t) = \beta_{03} + \beta_{13}\ln w_P(t) + \beta_{23}\ln w_T(t) + \beta_{33}\ln w_G(t) + \beta_{43}\ln va(t) + \mu_{03}, \quad (12)$$

where Ld_{PA}, Ld_{TA} and Ld_{GA} are the number of foreign professional labor or workers, the number of foreign technical labor and the number of foreign general labor, respectively. Meanwhile, w_P, w_T and w_G are the professional labor real wage rate, technical labor real wage rate and general labor real wage, respectively. t depicts the year and real value is built upon the base year of 2005. Equations (10)–(12) possess the same independent variables but different dependent variables. According to A. Zellner (1962), for this type of model specification, there will be correlated errors from several regression models and in this situation, the Ordinary Least Square (OLS) estimation method is inefficient. To overcome this weakness, the SUR approach using the Generalized Least Square (GLS) is utilised and estimated using the STATA software.

Elasticity of labor-value added obtained from the estimation of equations (10)–(12) will be used to project the need for foreign labor using the formula:

$$L_{ijt} = L_{ij0} + (L_{ij0} x G_{va} x (n-0) x \beta_{L\theta}), \quad (13)$$

where L_{ijt}, L_{ij0}, G_{va} and $\beta_{L\theta}$ are the projected workforce for the subsector j of category i in year t, employment for subsector j of category i at base year, the annual value-added growth rate in the projection period, and elasticity labor-value added according to type of foreign labor, respectively. n is the projection year, 0 is the base year.

Key results.

Unit root test. Prior to estimating the foreign labor demand model, the unit root test was conducted. This is to validate whether the time series variables are stationary at level or at difference. A variable can be considered as stationary if its mean and vari-

ance are constant at all times. Each variable in a regression equation has to be stationary at a similar level. This condition must be met so that the estimated coefficients are valid. If otherwise, a spurious regression will exist, i.e. estimation results are found to be good, but in reality there is no relationship between the dependent and independent variables (Newbold and Granger, 1974). In this study, the unit root tests are done using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. The results of unit root test for both situations, constant with trend and constant without trend, are presented in Table 1. The results show that all data are stationary at level I(0), therefore, the foreign labor demand models can be estimated without altering the data.

Table 1. **Results of ADF and PP,** *authors'*

Variable	Augmented Dickey-Fuller		Philips Perron	
	Without trend	Trend	Without trend	Trend
	Level I(0)			
ln Number of Foreign Professional Labor	-3.934014*** (0.077791)	-3.945757 ** (0.081048)	-4.060211*** (0.077791)	-4.113707*** (0.081048)
ln Number of Foreign Technical Labor	-3.628843*** (0.067987)	-3.974159 ** (0.082159)	-3.587575*** (0.067987)	-3.903211 ** (0.082159)
ln Number of Foreign General Labor	-5.035296*** (0.092180)	-5.322490*** (0.097391)	-5.045205*** (0.092180)	-5.361738*** (0.097391)
ln Professional Labor Real Wage	-8.244879*** (0.110512)	-8.239423*** (0.111194)	-8.248136*** (0.110512)	-8.240434*** (0.111194)
ln Technical Labor Real Wage	-7.970300*** (0.110163)	-7.982403*** (0.110899)	-8.007496*** (0.110163)	-7.985991*** (0.110899)
ln General Workers Real Wage	-6.654400*** (0.106344)	-6.706312*** (0.107552)	-6.764085*** (0.106344)	-6.797227*** (0.107552)
ln Real Value Added	-3.864410*** (0.075987)	-3.833072** (0.076518)	-3.820880*** (0.075987)	-3.786736** (0.076518)

Note: Figures in parantheses are standard deviations.
*** significant at 1% significance level; ** significant at 5% significance level; * significant at 10% significance level.

Estimation results. Estimation results of foreign labor demand models according to skills and subsectors are presented in Table 2. The findings indicate that the sector value added influences the demand for foreign labor positively and significantly in all construction subsectors except for special construction. For the residential building, an increase of 1% in value added will increase the demand for foreign professional, technical and general laborers by 2.769%, 2.463% and 1.739%, respectively. For non-residential building subsector, an increase of 1% in value added will raise the demand for foreign professional, technical and general laborers by 1.764%, 2.126% and 1.536%, respectively. The elasticity of labor-real value added for civil engineering shows that an increase of 1% in value added will increase the demand for foreign professional, technical and general laborers by 1.032%, 0.728% and 0.989%, respectively.

Estimation results in Table 2 also indicate the effects of change in wage on the demand for various categories of foreign laborers. It shows that this impact differs according to subsector. For foreign professionals, the impact of change in professional wage is positive and significant in special construction subsector. This shows that the demand for foreign professionals will increase, even though the wage rate for this job category increased. For foreign technical staff, the impact of change in wage rate

Table 2. **Estimation results for Seemingly Unrelated Regression (SUR) for the construction subsectors,** *authors'*

Variables	Residential building			Non-residential building			Civil engineering			Special construction		
	ln Foreign Profes-sional Workers	ln Foreign Technical Workers	ln Foreign General Workers	ln Foreign Profes-sional Workers	ln Foreign Technical Workers	ln Foreign General Workers	ln Foreign Profes-sional Workers	ln Foreign Technical Workers	ln Foreign General Workers	ln Foreign Profes-sional Workers	ln Foreign Technical Workers	ln Foreign General Workers
ln Real value added	2.769394** (1.371546)	2.463384*** (0.9484472)	1.739598*** (0.6632536)	1.763829*** (0.6546702)	2.126152*** (0.5724316)	1.535789*** (0.279966)	1.031996** (0.4348757)	0.7283336** (0.3041196)	0.9895672*** (0.274588)	0.4933794 (0.398842)	0.321669 (0.3996121)	0.2037297 (0.48411)
ln Profes-sional real wage	1.792461 (6.272678)	-2.62896 (4.337661)	-3.1298 (3.033347)	-5.975878 (10.1093)	-4.843219 (8.839384)	7.852561* (4.323184)	2.918416 (2.811791)	-3.41346* (1.966356)	6.777593*** (1.775413)	10.15739*** (1.646765)	1.550391 (1.649944)	2.42332 (1.998825)
ln Technical real wage	-0.0436473 (5.512072)	5.098337 (3.81169)	2.517509 (2.665533)	5.036634 (7.788239)	8.945212 (6.809894)	-1.914247 (3.3-30597)	2.381167 (6.589524)	13.99442*** (4.608221)	-12.12305*** (4.160738)	-8.729594*** (1.584174)	0.2401747 (1.587232)	4.753102** (1.922853)
ln General real wage	-7.537555** (3.561365)	-5.012912** (2.462743)	-0.2965314 (1.722208)	-5.006599 (4.003306)	-7.770059** (3.500417)	-5.201865** (1.711991)	-8.469487** (4.115858)	-11.69128*** (2.878324)	3.98095 (2.598823)	0.0247153 (0.1412984)	-1.142842*** (0.1415712)	-2.040808*** (0.1715065)
Constant	0.4561889 (6.542756)	-15.71521*** (4.524425)	-13.12522*** (3.163951)	24.89717 (18.76773)	-1.736614 (16.41016)	-33.73272*** (8.025914)	6.252145 (5.756939)	-2.435874 (4.025973)	-2.003803 (3.63503)	-21.95865*** (6.236887)	-7.522816 (6.248929)	-41.46651*** (7.570265)
R^2	0.4737	0.5146	0.6027	0.4671	0.5043	0.8166	0.4951	0.4979	0.6620	0.7374	0..9173	0.9466
Chi ^{2}	18.90***	22.27***	31.86***	17.53***	20.34***	89.06***	20.59***	20.83***	41.13***	56.15***	221.69***	354.74***
P-value	0.0008	0.0002	0.0000	0.0015	0.0004	0.0000	0.0004	0.0003	0.0000	0.0000	0.0000	0.0000
Number of Observa-tions	21	21	21	20	20	20	21	21	21	20	20	20
Breusch-Pagan Chi^2 (3)	15.375**			16.128**			34.404***			1.658		
Proba-bility	0.0015			0.0011			0.0000			0.6464		

Note: Figures in paranthese are standard deviations.
*** significant at 1% significance level; ** significant at 5% significance level; * significant at 10% significance level.

is positive and significant for civil engineering subsector only. Meanwhile, for foreign general labor, the impact of change in wage rate is negative and significant in non-residential building and special construction subsectors. Most coefficients for cross wage show insignificant value. For example, the impact of technical labor wage on demand for foreign professionals is only negative and significant in special construction, showing that both categories of workers complement each other. However, there are many coefficients which are negative and significant for the cross effect of general labor wage rate. For example, general labor wage rate is negative and significant toward foreign technical labor demand in all the subsectors, hence, indicating complementary status for workers in both categories. There is also a complementary effect between foreign general and professional labors in residential building and civil engineering subsectors.

A forecast of foreign labor demand. According to Table 3, non-residentail building recorded higher value added growth compared to other subsectors, i.e. at 17%; followed by special construction activities subsector which an expected value added growth at 13%. The subsectors that are expected to record low value added growth are civil engineering and residential buildings at 4% and 5%, respectively. Even though residential building is expected to experience low value added growth, the percentage of increase in demand for foreign labor is the highest. Low value added growth of this subsector is the result of the concentration of housing projects in this country that more towards low cost and more affordable housings.

Table 3. **Forecast of foreign labor demand in construction subsectors according to job category by the year 2020,** *authors'*

Category	L_{ij0} (2010)	G_{va}	n	$\beta_{L\theta}$	L_{ij2020}
Residential building					
Professional	56	0.05	10	2.769	134
Technical	23	0.05	10	2.463	51
General	209	0.05	10	1.740	391
Total	**288**				**576**
Non-residential building					
Professional	37	0.17	10	1.764	148
Technical	43	0.17	10	2.126	198
General	350	0.17	10	1.536	1264
Total	**430**				**1610**
Civil engeering					
Professional	157	0.04	10	1.032	222
Technical	268	0.04	10	0.728	346
General	224	0.04	10	0.990	313
Total	**649**				**881**
Special construction activities					
Professional	62	0.13	10	0.493	102
Technical	85	0.13	10	0.491	139
General	217	0.13	10	1.473	633
Total	**364**				**874**

Note: $G_{va} = r = \sqrt[n]{\frac{va_t}{va_0}} - 1;\ L_{ijt} = L_{ij0} + (L_{ij0} \times G_{va} \times (n-0) \times \beta_{L\theta}.$

The forecast of foreign labor demand shows that the subsector expected to utilise the least foreign skills is residential building, i.e. at 14.6% of the total needs for the year 2020. Non-residential building is expected to require the most of foreign labor, i.e. at 40.8% of the total demand for foreign labor. When comparing the stock of workforce in 2010, non-residential building is expected to experience the highest percentage of demand change in 2020 at 274%, followed by special construction activities at 140%, residential building with 100% percent and civil engineering at 35.7%. The demand for foreign labor by job category shows that by 2020 it might reach 66.0% for general labor, 18.6% for technical personnel and 15.4% for professional workers. The demand for foreign general labor will increase by 160.1% in 2020 as compared to 2010, followed by the demand for foreign professionals at 94.2% and foreign technical at 75.2%.

Conclusion and prospects for further research. Overall, the study shows an increase in labor demand in the construction sector. It is found that non-residential building subsector is growing, as indicated by the relative high value added growth as compared to other subsectors. The need for foreign labor is also concentrated in this subsector. This is because non-residential building has a commercial value. The increasing trend of demand for such construction product for speculative purposes does somewhat impact the growth of non-residential building. The demand for foreign professionals in this subsector must be given more attention so that better return can be gained for the sake of future economic growth.

Projection of foreign labor requirement shows that the requirement is more towards general workers category, i.e. at 66% of the total foreign labor demand. In fact, the demand for non-skilled workers will increase up to 160% by the year 2020 as compared to 2010. However, there is also an increase in the need for foreign professionals. Thus, education and training centers need to focus on their plannings and produce labor force in accordance to current needs.

Increase in the need for foreign labor, especially low-skilled one, shows the unwillingness of local laborers to work on these "low-status" jobs. This situation is difficult to be addressed in the short run, but it can be remedied in the long run through good strategies. This matter needs a shift in the mindset and a new perception of local workers toward construction jobs through trainings and more attractive work contracts. For example, an insurance scheme may be provide introuduced to more benefits to workers.

This study has several weaknesses that can be improved in future research. This study only provides the forecast of foreign professional, technical and general workers at the 3-digit level. The study includes foreign workers who are legally hired and excludes illegal ones and directly hired. Even though there are data of workers who are directly hired, it does not split the workers into local and foreign. Data on illegal foreign workers is not available as such. Future study may be conducted at the 5-digit level and take into account foreign laborers who are directly hired by asking DOS to split the data. Such study may provide more detailed information on types of foreign workers in facilitating the planner in better training programs design.

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