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MEASURING SPATIAL MIGRATION FOCUSING IN KLANG VALLEY, MALAYSIA

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ABSTRACT

Internal migration is one of the crucial urban phenomena that affects physical, economic and social aspects of urban planning and development. Many scholars in this area agree that a shortfall of urban planning is due to the difficulty of understanding migration systems in urban areas. Thus, urban planners are obligated to understand spatial migration focusing in urban areas in order to plan of what migration needs. This article attempts to discuss the application of Multiplicative Component Model (MCM) for measuring the migration systems in the Klang Valley region. For the analysis, only three years (period) of migration data (life time migration) are used: years 1980, 1991, and 2000. Life migration data from the 2010 census is still not available. From this application, it is shown that the MCM model has successfully explained the trends and migration distribution in the Klang Valley especially at the macro level.

Keywords: internal migration; migration system; spatial migration; Multiplicative Component Model; urban planning.

1. INTRODUCTION

Understanding of spatial trends and distribution of migration (also called migration systems) in urban areas is crucial for the purpose of urban planning decision making (Mohd Fadzil & Ishak 2011; Mohd Fadzil *et al.*, 2014). This is because the migration phenomenon is one of the important factors that has contributed to a high level of population in urban areas. So, without an adequate planning and support, migration leads to escalating crucial urban problems such as squatter settlements, slum areas, traffic congestions, urban poor, urban sprawl, etc. Such problems occur in cities of developing countries which experience rapid urban growth as well as at intermediate levels of their demographic transition such as in Malaysia, Indonesia, Philippine, etc. The Klang Valley region also has experienced such problems. It occurred partly as a result of the difficulty to understand migration systems in urban areas (Mohd Fadzil, 2010; Mohd Fadzil *et al.*, 2014).

It is likely that the shortfall of urban planning could not be rectified without appropriate analysis for spatial distribution of migration potential in urban areas (Plane & Rogerson, 1994). This scenario gives a vital challenge for urban planners to estimate and understand migration systems in urban areas. This article attempts to discuss the application of the MCM for measuring the spatial distribution of migration in urban areas. Perhaps, it would provide

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urban planners with a useful tool or model on how to estimate and understand migration systems in urban areas.

2. MULTIPLICATIVE COMPONENT MODEL (MCM)

The Multiplicative component model (MCM) is developed by Rogers *et al.,* (2002). According to Raymer and Rogers (2005), the model is used for measuring and describing interregional migration flows based on four separate components of migration (Rogers *et al.,* 2002). The four components are:

a) an overall component representing the level of migration in total;

b) an origin component representing the relative "pushes" from each region;

c) a destination component representing the relative "pulls" to each region; and

d) a two-way origin-destination interaction component representing the physical or social distance (or multiple factors) between places (not explained by the overall and main effects).

With reference to Raymer and Rogers (2005), the formula for overall component in MCM is shown below:

$$\text{Multiplicative component} = n_{ij} = T*O_i*D_j*(OD)_{ij} \quad (1)$$

Its multiplicative (Formula 1) can be broken down into four components as follows:

$$\text{An overall component} = T \quad (2)$$

$$\text{An origin component} = O_i \quad (3)$$

$$\text{A destination component} = D_j \quad (4)$$

$$\text{An origin-destination interaction component} = (OD)_{ij} = n_{ij}/(T*O_i*D_j) \quad (5)$$

where n_{ij} is an observed flow of migration from region i to j, T is the total number of migrants, $O_i = O_{i+}/T$ is the proportion of all migrants leaving from region i, $D_j = D_{+j}/T$ is the proportion of all migrants moving to region j. While the interaction component $(OD)_{ij}$ is defined as $n_{ij}/(T*O_i*D_j)$ or the ratio of observed migration flows to expected migration flows. All these notations can be obtained from Table 1.

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Table 1: Structure of data from MCM.

i	*j*						**Total (O)**	**Proportion = O_{i+}/T**
	1	*2*	*3*	*j*	.	.		
1							**O_{1+}**	**O_1**
2							**O_{2+}**	**O_2**
3							**O_{3+}**	**O_3**
i				**n_{ij}**			**O_{i+}**	**O_i**
.							.	.
.							.	.
Total (D)	**D_{+1}**	**D_{+2}**	**D_{+3}**	**D_{+j}**	.	.	**T**	
Proportion = D_{+j}/T	**D_1**	**D_2**	**D_3**	**D_j**	.	.		

3. THE APPLICATION OF THE MCM FOR MEASURING SPATIAL MIGRATION FOCUSING IN THE KLANG VALLEY

This section describes the application of the MCM for measuring the spatial migration in the Klang Valley. It includes introduction to the Klang Valley, data, method of analysis, and results. The results of analyses will be discussed in the following two sub-sections: (a) spatial migration focusing within the districts/ areas of the Klang Valley, and (b) spatial migration focusing within spatial planning units of the Klang Valley.

3.1 Case Study: The Klang Valley Region

The Klang Valley region was established in 1973 as a result of recommendations from a regional planning study in the area. This region has experienced a continuous rapid population growth for the past two decades which was directly induced by the rapidity in net-migration. Currently, it is the fastest growing region in Malaysia with a 1.7% per annum average growth rate, and a total population of about 6.6 million people.

The Klang Valley region consists of five areas: the Federal Territory of Kuala Lumpur (the FT Kuala Lumpur); Gombak; Petaling; Klang; and Hulu Langat which cover an area of approximately 2,832 square kilometres. It is located roughly at the central part of the West Coast of Peninsular Malaysia (Figure 1).

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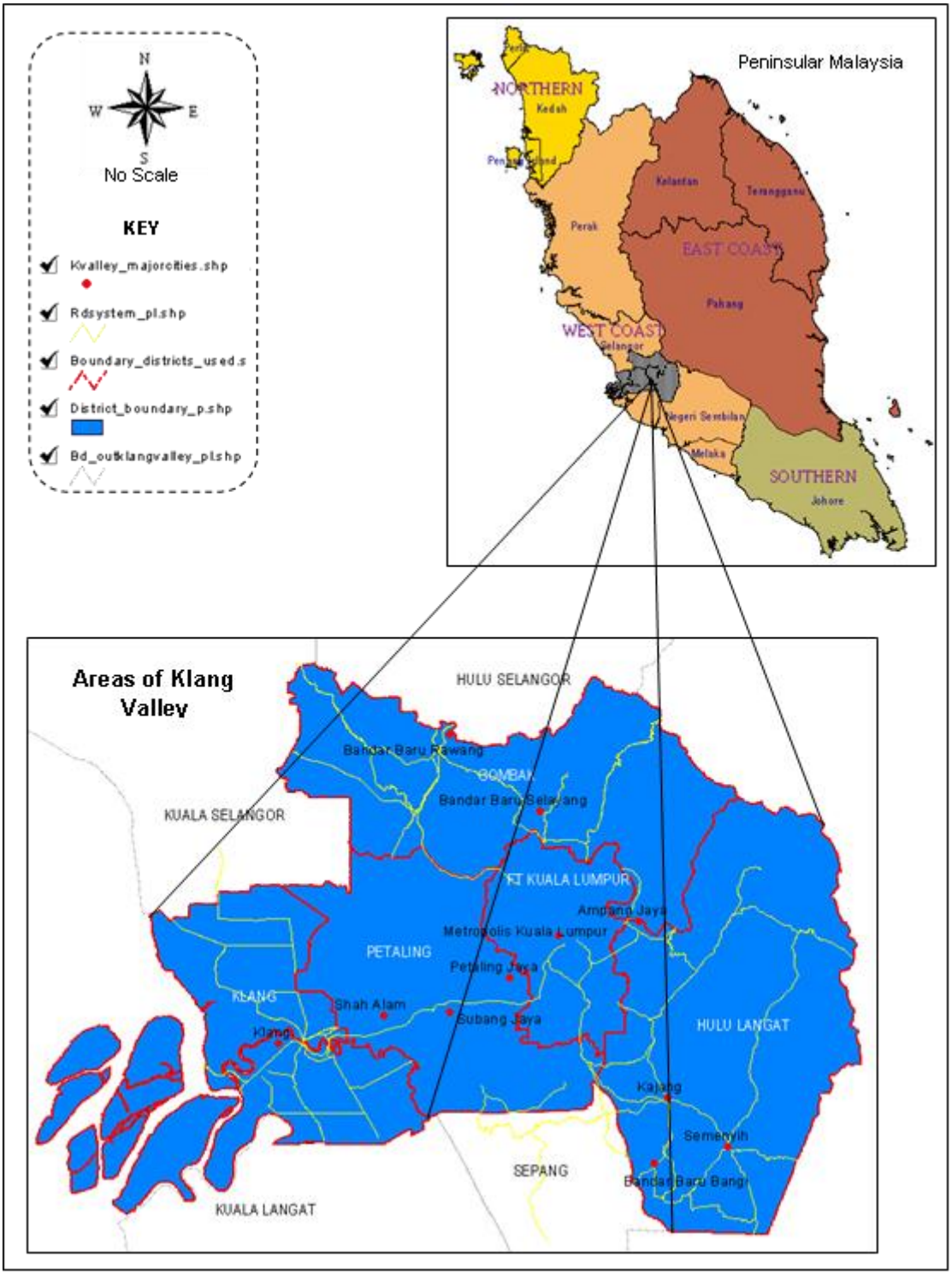

Figure 1: The location map of the Klang Valley and its cities.

Figure 1 shows that the region is dominated by several major city centres i.e. Metropolis Kuala Lumpur (the capital city of Malaysia), Petaling Jaya, Shah Alam, Subang Jaya, Klang and Ampang Jaya. It borders the Sepang and Kuala Langat districts which have become new growth areas in Malaysia due to development of mega projects in the Multimedia Super Corridor (MSC), KLIA, Putrajaya, and other townships. For the administrative matters, the

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Klang Valley is organised into eight Planning Local Authorities (PLAs), that is, the Kajang Municipal Council (MPKj), the Ampang Jaya Municipal Council (MPAJ), the Selayang Municipal Council (MPS), the Shah Alam City (MBSA), the Petaling Jaya City (MBPJ), the Subang Jaya Municipal Council (MPSJ), and the Klang Municipal Council (MPK).

3.2 Data

Migration data in the Klang Valley for the years 1980, 1991 and 2000 are shown in the matrix (Table 2) below. This matrix is developed taking into consideration the two way migration flows: is the in- and-out flows within the districts of the Klang Valley.

Table 2: In- and out-migration from outside and within the Klang Valley for the years 1980, 1991, and 2000.

	Year 1980						
	Destination						
Origin	**P.M**	**F.T.KL**	**G**	**P**	**K**	**HL**	**Total (Out)**
P.M	0	303,679	92,673	210,062	89,340	75,769	**771,523**
F.T. KL	190,670	0	34,587	48,849	6,621	22,390	**303,117**
G	40,534	12,232	0	3,703	848	2,632	**59,949**
P	76,878	17,278	3,505	0	3,132	2,775	**103,568**
K	77,178	11,040	1,601	10,089	0	1,419	**101,327**
HL	46,382	10,184	2,812	4,120	1,181	0	**64,679**
Total (In)	**431,642**	**354,413**	**135,178**	**276,823**	**101,122**	**104,985**	**1,404,163**
	Year 1991						
	M	**F.T.KL**	**G**	**P**	**K**	**HL**	**Total (Out)**
M	0	149,427	96,834	216,481	97,493	153,588	**713,823**
F.T. KL	343,803	0	25,351	31,925	4,978	43,123	**449,180**
G	75,861	16,449	0	6,765	1,347	6,793	**107,215**
P	145,254	19,963	5,002	0	8,170	8,271	**186,660**
K	83,622	3,532	1,185	8,937	0	1,750	**99,026**
HL	78,055	8,390	3,247	4,137	1,193	0	**95,022**
Total (In)	**726,595**	**350,547**	**131,619**	**268,245**	**113,181**	**213,525**	**1,650,926**
	Year 2000						
	M	**F.T.KL**	**G**	**P**	**K**	**HL**	**Total (Out)**
M	0	106,287	84,233	276,902	100,159	179,930	**747,511**
F.T. KL	315,327	0	22,261	44,078	5,441	49,017	**436,124**
G	69,018	8,680	0	7,988	1,475	6,161	**93,322**
P	181,361	10,703	5,388	0	27,423	10,544	**235,419**
K	73,221	2,112	1,213	7,839	0	2,261	**86,646**
HL	82,343	4,495	2,800	6,096	1,116	0	**96,850**
Total (In)	**721,270**	**247,070**	**115,895**	**342,903**	**135,614**	**247,913**	**1,695,872**

Note: P.M=Peninsular Malaysia, M=Malaysia, F.T.KL=Federal Territory of Kuala Lumpur, G=Gombak, P=Petaling, K=Klang, dan HL=Hulu Langat.

Sources:

1. Malaysia (1983). Population and Housing Census of Malaysia 1980. General Report of the Population Census. Volume 2. Putrajaya: Department of Statistics Malaysia.
2. Malaysia (1995). Population and Housing Census of Malaysia 1991. General Report of the Population Census. Volume 2. Putrajaya: Department of Statistics Malaysia.
3. Malaysia (2004). Population and Housing Census of Malaysia 2000. Migration and Population Distribution. Putrajaya: Department of Statistics Malaysia.

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From Table 2, there is quite a difference between the migration data in 1980, 1991 and 2000. This difference is based on the different definitions of migration. In 1980, a migrant is defined as an individual who changes a place of usual residence without fixing a time prior to the survey, while for the years 1991 and 2000, a migrant is defined as an individual who changes a place of usual residence in the last five years prior to the survey (i.e. 1986-1991, 1995-2000). All the data on migration were obtained from the census reports published by the Department of Statistics, Malaysia in the years 1983, 1995, and 2004.

3.3 Method Of Analysis

For this application, the MCM is used for analysing spatial migration focusing on the Klang Valley region. This application allows the analysis of spatial interaction of migration within the areas of the Klang Valley. Hence, the districts/areas have been classified into 5 stages of urban development (i.e., level 1 to level 5) based on their number of urban population (Table 3).

Table 3: Ranking of level of urban development among the areas of the Klang Valley for the years 1980, 1991 and 2000.

Districts	**Urban Population ('000)**					
	1980		**1991**		**2000**	
	Number	Ranking	Number	Ranking	Number	Ranking
FT Kuala Lumpur	919.6	1	1,145.3	1	1,297.5	1
Gombak	-	5	315.5	5	548.2	5
Petaling	242.8	2	588.4	2	1,181.0	2
Klang	192.0	3	368.4	3	631.7	4
Hulu Langat	42.2	4	361.7	4	839.8	3

Sources:

1. Malaysia (2001). Population and Housing Census of Malaysia 2000. Preliminary Count Report for Urban and Rural Areas. Putrajaya: Department of Statistics Malaysia.
2. Malaysia (1983). Population and Housing Census of Malaysia 1980. General Report of the Population Census. Volume 2. Putrajaya: Department of Statistics Malaysia.

Table 3 indicates the ranking of levels of urban development among the areas of the Klang Valley for three time periods: 1980, 1991, and 2000. Since 1980, FT Kuala Lumpur has remained in the first ranking. It is followed by the Petaling District and the Klang District. In the same year, the Hulu Langat District and the Gombak District had ranked fourth and fifth respectively. In 1991, the ranking remained the same as in 1980. However, in 2000, the Hulu Langat District had outranked the Klang District from the fourth to the third ranking. This change happened in parallel with the urbanisation process in the Klang Valley. From the core areas (the FT Kuala Lumpur), the urbanisation process had shifted to new cities in the urban fringe (Katiman, 2007) and cities that bordered FT Kuala Lumpur especially in the Hulu Langat and Gombak districts.

The purpose of this analysis is to measure and understand the relationship between stages of urban development and levels of spatial migration focusing flows (or between places). In the MCM, results of analyses will be obtained on the basis of calculation of the interaction component $(OD)_{ij}$ which is by using Formula (5). The high ratio (between observed migration flows and expected migration flows) indicates the high relationship between places and vice-versa.

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3.4 Spatial Migration Focusing Within The Districts Of Klang Valley

The results for spatial migration focusing in the areas of the Klang Valley based on the calculation of the three sets of migration data are shown in Table 4.

Table 4: Results of spatial migration for the years 1980, 1991, and 2000.

(a) Year 1980							
Destination / **Origin**	**Level of Spatial Interaction** $(OD)_{ij}$						
	P.M	**F.T. KL**	**G**	**P**	**K**	**HL**	**Total Out (%)**
P.Malaysia	0.000	0.872	0.698	0.772	0.899	0.735	**54.9**
F.T. KL	1.144	0.000	0.663	0.457	0.170	0.552	**21.6**
G	1.230	0.452	0.000	0.175	0.110	0.328	**4.3**
P	1.350	0.370	0.197	0.000	0.235	0.200	**7.4**
K	1.386	0.241	0.092	0.282	0.000	0.105	**7.2**
HL	1.305	0.349	0.253	0.181	0.142	0.000	**4.6**
Total In (%)	**30.7**	**25.2**	**9.6**	**19.7**	**7.2**	**7.5**	**100.0**
(b) Year 1991							
Destination / **Origin**	**Level of Spatial Interaction** $(OD)_{ij}$						
	M	**F.T. KL**	**G**	**P**	**K**	**HL**	**Total Out (%)**
M	0.000	1.748	1.702	1.866	1.992	1.664	**43.2**
F.T. KL	1.739	0.000	0.708	0.437	0.162	0.742	**27.2**
G	1.608	1.281	0.000	0.388	0.183	0.490	**6.5**
P	1.768	0.893	0.336	0.000	0.638	0.343	**11.3**
K	1.919	0.298	0.150	0.555	0.000	0.137	**6.0**
HL	1.866	0.737	0.429	0.268	0.183	0.000	**5.8**
Total In (%)	**44.0**	**12.0**	**8.0**	**16.2**	**6.9**	**12.9**	**100.0**
(c) Year 2000							
Destination / **Origin**	**Level of Spatial Interaction** $(OD)_{ij}$						
	M	**F.T. KL**	**G**	**P**	**K**	**HL**	**Total Out (%)**
M	0.000	1.823	1.649	1.832	1.676	1.647	**44.1**
F.T. KL	1.700	0.000	0.747	0.500	0.156	0.769	**25.7**
G	1.739	1.192	0.000	0.423	0.198	0.452	**5.5**
P	1.811	0.583	0.335	0.000	1.457	0.306	**13.9**
K	1.987	0.313	0.205	0.447	0.000	0.179	**5.1**
HL	1.999	0.595	0.423	0.311	0.144	0.000	**5.7**
Total In (%)	**42.5**	**7.8**	**6.8**	**20.2**	**8.0**	**14.6**	**100.0**

Note: P.M=Peninsular Malaysia, M=Malaysia, F.T.KL=Federal Territory of Kuala Lumpur, G=Gombak, P=Petaling, K=Klang, dan HL=Hulu Langat

a) Levels of urban development in 1980: F.T.KL=1, G=5, P=2, K=3, HL=4
b) Levels of urban development in 1991: F.T.KL=1, G=5, P=2, K=3, HL=4
c) Levels of urban development in 2000: F.T.KL=1, G=5, P=2, K=4, HL=3

Table 4 shows that the spatial interaction between internal migration and the levels of urban development in the Klang Valley in 1980, 1991, and 2000 happens dynamically which means that there are direct and indirect interactions. For this result, direct interaction means high flow of migration moving from areas which have low level of urban development to areas with high urban development. The indirect interaction means high flow of migration moving from areas with high level of urban development to areas with low urban development.

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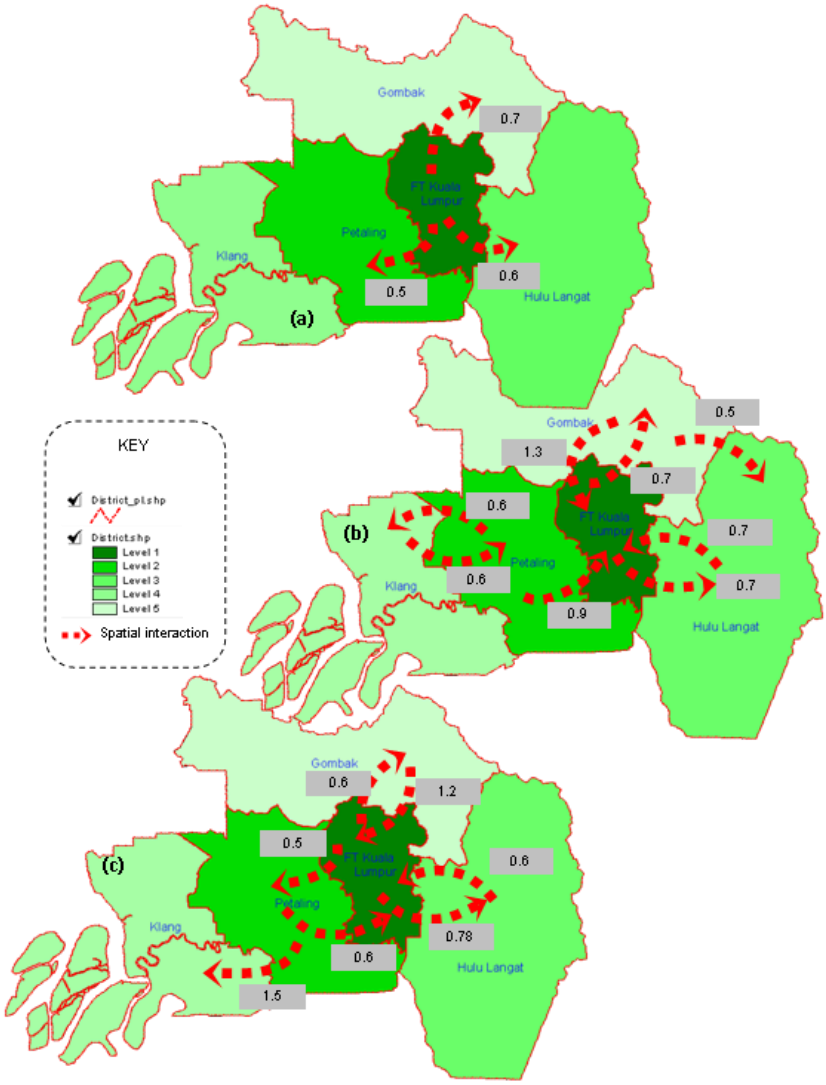
For this analysis, high flow of migration is referred to as values of spatial interaction ≥ 0.5 (see Rogers *et al.*, (2002)). For instance, in the year 1980, the value of spatial interaction between the FT Kuala Lumpur and Gombak districts, and the FT Kuala Lumpur and Hulu Langat districts was higher than 0.5. Thus, the flow of migration from these two areas will be considered in this analysis. In these two cases, indirect interaction occurs due to high flow of migration moving from FT Kuala Lumpur with high level of urban development to the areas with low level of urban development that is the Gombak District and Hulu Langat districts (see Table 4).

Based on Table 4, the scenario of spatial interaction between internal migration and the levels of urban development for the 3 periods based on values of spatial interaction of ≥ 0.5 is shown in Figure 2.



Note: The values of level interaction have been rounded to one place of decimal

a) Levels of urban development in 1980: F.T.KL=1, G=5, P=2, K=3, HL=4
b) Levels of urban development in 1991: F.T.KL=1, G=5, P=2, K=3, HL=4
c) Levels of urban development in 2000: F.T.KL=1, G=5, P=2, K=4, HL=3

Figure 2: Spatial migration focusing in the Klang Valley based on values of ≥ 0.5.

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In 1980, reverse interaction occurred where out-migration from the FT Kuala Lumpur (level 1) to the neighbouring districts which were less developed such as the Gombak District (level 5) and the Hulu Langat District (level 4) with an interaction value of 0.66 and 0.55 respectively. In 1991, direct and reverse interaction occurred in all the districts or areas in the Klang Valley. The Hulu Langat District received very significant number of in-migration from both the FT Kuala Lumpur and the Gombak District. The Petaling, Klang and Gombak districts experienced equally significant in-and-out-migration (Figure 2).

In 2000, the flow of migration in the Klang Valley is clearly understandable, where reverse interaction between migration and urban development occurred quite obviously. People from an area with high level of urban development have moved to an area with low level of urban development such as from the FT Kuala Lumpur to Hulu Langat District and Gombak District; Petaling District to Klang District. This migration scenario happened in line with the change of urban development in the Klang Valley that had spread from the FT Kuala Lumpur to the urban fringe that bordered it. However, the FT Kuala Lumpur still experienced dynamic interaction especially with its neighbours Gombak, Hulu Langat and Petaling districts. This occurred possibly due to the function of the FT Kuala Lumpur as an area that offered various modern services, opportunities and market especially to the lower classes (at the early stage of looking for a job). Thus, this group tended to migrate to FT Kuala Lumpur. Meanwhile, the middle classes had moved from FT Kuala Lumpur mostly to enjoy a more comfortable life and have their own property. Migration among them tend to happen towards neighbouring areas that border FT Kuala Lumpur owing to a change in the place of residence which does not always involve change in the place of work.

In addition, the percentages of net out- and-in-migration for each area of the Klang Valley were calculated based on Table 4. For instance, the net migration for the FT Kuala Lumpur in 1980 was calculated as 25.2% of in-flow minus 21.6% of out-flow which equals 3.6%. The results of the calculation of the net migration for each area of the Klang Valley for all periods of years are shown in Table 5.

Table 5: The net out- and in-migration for each area in the Klang Valley, 1980-2000.

Areas	1980	1991	2000
	Net migration (%)	Net migration (%)	Net migration (%)
FT Kuala Lumpur	3.6	-15.2	-17.9
Gombak	5.3	1.5	1.3
Petaling	12.3	4.9	6.3
Klang	0.0	0.9	2.9
Hulu Langat	2.9	7.1	8.9

Based on Table 5, FT Kuala Lumpur had experienced net out-migration from 1991 to 2000. This situation is expected to continue because there has been a significant tendency of out-migration by FT Kuala Lumpur population to the urban fringe since 1991. The Hulu Langat District, Petaling District and Klang District have experienced an increase in net in-migration from the year 1991 to 2000. Meanwhile, the Gombak District had recorded declining net in-migration from1991 to 2000.

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3.5 Spatial Migration Focusing Within The Spatial Planning Units Of The Klang Valley

There are no suitable migration data which can be obtained from the Department of Statistics, Malaysia for implementing the analysis trends and distribution of migration within the spatial planning units of the Klang Valley. In this analysis, spatial planning units refer to the eight areas of administration (PLAs). Thus, migration matrix data for each spatial planning unit need to be developed. Thwe (2004) shows the way of developing the migration matrix table for spatial planning units in Myanmar. With reference to Thwe (2004), the process of developing the migration matrices for each spatial planning unit in 2000 is as follows:

a) use migration matrices by the districts of the Klang Valley in 2000 as the basis data (see Table 2);

b) calculate population ratio for each spatial planning unit based on the population distribution data in the Klang Valley in 2000 (see Table 6); and

c) calculate flow of migration (migration matrix) for each spatial planning unit.

Table 6 indicates the results of the calculation of population ratio for each spatial planning unit by districts in 2000. Based on this population ratio, the migration matrix for each spatial planning unit can now be developed.

Table 6: Population ratio by spatial planning units of the Klang Valley, 2000.

Spatial planning units by districts	**2000**	
	Population Size	Population ratio (%)
DBKL	**1,305,792**	**100.00**
Total	**1,305,792**	**100.00**
Gombak	***537,525***	
MPS	416,837	77.55
MPAJ-G	120,688	22.45
Total	**537,525**	**100.00**
Petaling	***1,184,180***	
MBSA-P	314,440	26.55
MBPJ	432,619	36.53
MPSJ	437,121	36.91
Total	**1,184,180**	**100.00**
Klang	***643,436***	
MPK	362,239	56.30
MBSA-K	81,197	12.62
Total	**643,436**	**100.00**
Hulu Langat	***864,451***	
MPKj	506,526	58.60
MPAJ-H	357,925	41.40
Total	**864,451**	**100.00**

Note: DBKL=Kuala Lumpur City Hall; MPS=Selayang Municipal Council; MPAJ-G=Ampang Jaya Municipal Council (in Gombak district); MPAJ-H= Ampang Jaya Municipal Council (in Hulu Langat district); MBSA-P=Shah Alam City (in Petaling district); MBSA-P=Shah Alam City (in Klang district); MBPJ=Petaling Jaya City; MPSJ=Subang Jaya Municipal Council; MPK: Klang Municipal Council; MPKj: Kajang Municipal Council.

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By following the process outlined above, the way of calculating the migration flows, for instance, for Gombak District and Petaling District for the year 2000 is shown in Table 7.

Table 7: Way of calculating migration flows for each spatial planning unit.

Origin			Destination PETALING			TOTAL (OUT)
			MBSA-P	MBPJ	MPSJ	
GOMBAK:	**TOTAL (OUT) = 7,988**		**26.55**	**36.53**	**36.91**	
MPS	77.55%	6,195	1,645	2,263	2,287	6,195
MPAJ-G	22.45%	1,793	476	655	662	1,793
TOTAL (IN)			**2,121**	**2,918**	**2,949**	**7,988**

Note: also refer to Table 2 and Table 6.

Based on Table 7, the total migration flows from Gombak District to Petaling District is 7,988. With reference to the number of spatial planning units, the 7,988 flows of migration in Gombak District have been divided into two spatial planning units: 6,195 flows for the MPS and 1,793 flows for the MPAJ-G. Then, the total flows of migration in the MPS and MPAJ-G are distributed into three spatial planning units in the Petaling District based on their population ratio: the sub-areas of the MBSA (or the MBSA-P), MBPJ and MPSJ.

Through the calculation process, the distribution of migration flows for all the spatial planning units in the Klang Valley in 2000 are shown in Table 8.

Table 8: Distribution of migration in the Klang Valley by local authority areas (spatial planning units), 2000.

In/ Out	M	DBKL	MPS	MPAJ	MBSA	MBPJ	MPSJ	MPK	MPKj	Total (Out)
M	0	106,872	65,323	93,400	86,157	101,153	102,232	87,519	105,440	**747,511**
DBKL	315,327	0	17,263	25,291	12,390	16,101	16,274	4,754	28,724	**436,124**
MPS	53,523	6,731	0	1,978	1,789	2,263	2,287	1,000	2,800	**72,371**
MPAJ	49,585	3,811	1,467	0	1,786	1,423	1,472	693	810	**61,047**
MBSA	57,391	3,109	1,230	2,463	0	526	551	6,362	1,807	**73,439**
MBPJ	66,251	3,910	1,526	2,037	732	0	532	8,754	2,257	**85,999**
MPSJ	66,959	3,951	1,539	2,059	741	537	0	8,847	2,281	**86,916**
MPK	63,981	1,845	822	1,056	1,819	2,502	2,528	0	1,158	**75,711**
MPKj	48,253	2,633	1,273	368	1,032	1,305	1,319	571	0	**56,754**
Total (In)	**721,270**	**247,070**	**90,443**	**128,654**	**106,446**	**125,810**	**127,195**	**118,500**	**145,277**	**1,695872**

Note:

1. Little adjustment has been done so as to complete this matrix table especially for MBSA and MPAJ.
2. M=Malaysia; DBKL=Kuala Lumpur City Hall; MPS=Selayang Municipal Council; MPAJ=Ampang Jaya Municipal Council; MBSA=Shah Alam City; MBPJ=Petaling Jaya City; MPSJ=Subang Jaya Municipal Council; MPK: Klang Municipal Council; MPKj: Kajang Municipal Council.

Table 8 indicates the migration matrices by the spatial planning units in the Klang Valley for the year 2000. With reference to Table 8, for instance, the migration flows from the MPS (which are highlighted in dark colour) are distributed into the MBSA, MBPJ and MPSJ with total flows of 1,786, 2,263 and 2,287 respectively. The value of flows for the MBSA in Table 7 is different from the value of flows as shown in Table 8. This is because the value of flows for the MBSA comes from a summation of the value from the MBSA-P and MBSA-K. The

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same method is used for calculation of value for the MPAJ which is the summation of the value from the MPAJ-G and MPAJ-H.

Based on the migration data (Table 8), the results on spatial interaction of migration within the spatial planning units in the Klang Valley in 2000 based on MCM are shown in Table 9.

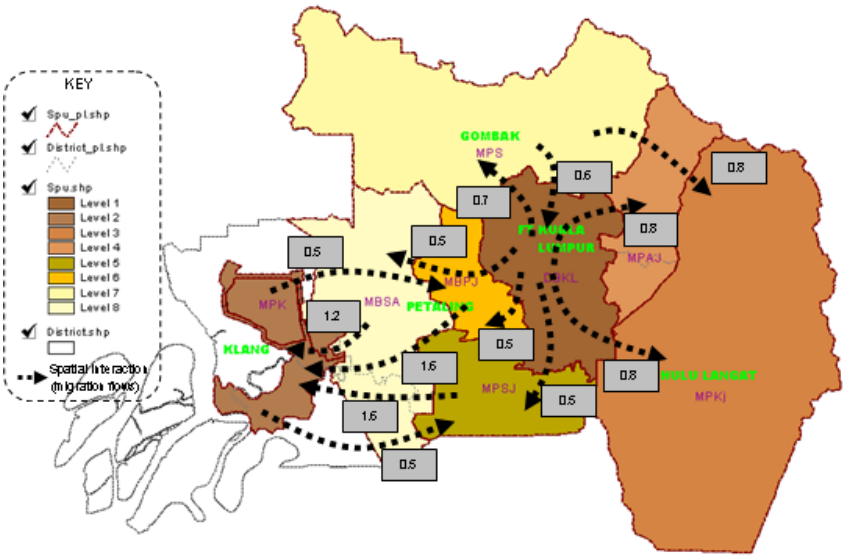
Table 9: Spatial structure of migration within spatial planning units in the Klang Valley, 2000.

Destination / Origin	Level of spatial interaction $(OD)_{ij}$									Total Out (%)
	M	DBKL	MPS	MPAJ	MBSA	MBPJ	MPSJ	MPK	MPKj	
M	0.000	0.976	1.639	1.647	1.836	1.824	1.823	1.676	1.647	**44.08**
DBKL	1.700	0.000	0.742	0.764	0.453	0.498	0.498	0.156	0.769	**25.72**
MPS	1.739	0.638	0.000	0.360	0.394	0.422	0.421	0.198	0.452	**4.27**
MPAJ	1.910	0.428	0.451	0.000	0.466	0.314	0.321	0.162	0.155	**3.60**
MBSA	1.837	0.291	0.314	0.442	0.000	0.097	0.100	1.240	0.287	**4.33**
MBPJ	1.811	0.312	0.333	0.312	0.136	0.000	0.082	1.457	0.306	**5.07**
MPSJ	1.811	0.312	0.332	0.313	0.136	0.083	0.000	1.457	0.306	**5.13**
MPK	1.987	0.167	0.204	0.184	0.383	0.445	0.445	0.000	0.179	**4.46**
MPKj	1.999	0.318	0.421	0.085	0.290	0.310	0.310	0.144	0.000	**3.35**
Total In (%)	**42.53**	**14.57**	**5.33**	**7.59**	**6.28**	**7.42**	**7.50**	**6.99**	**8.57**	**100.0**

Note: M=Malaysia; DBKL=Kuala Lumpur City Hall; MPS=Selayang Municipal Council; MPAJ=Ampang Jaya Municipal Council; MBSA=Shah Alam City; MBPJ=Petaling Jaya City; MPSJ=Subang Jaya Municipal Council; MPK: Klang Municipal Council; MPKj: Kajang Municipal Council.

Table 9 shows that among all the spatial planning units, DBKL is the area that contributes migration the most. Other areas of the Klang Valley receive migration from DBKL, except the MPS which receives and contributes migration to DBKL.

Figure 3 shows the flow of migration among the areas in 2000 based on the values of spatial interaction of ≥ 0.5 which are shown in Table 9.



Note: Values of level of interaction have been rounded to one place of decimal

Figure 3: Spatial migration focusing within the spatial planning units of the Klang Valley (values of ≥ 0.5).

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Figure 3 clearly shows that DBKL remains to be the area that contributes migration to other areas in the Klang Valley. This situation is expected to continue because DBKL has become saturated of built-up areas. This causes distribution of economic and physical development in the urban fringe. MPK is also expected to experience an increase in the number of migration in the future as a result of migration flow from Petaling especially from MBSA, MBPJ and MPSJ. The same goes to MPKj, MPAJ, MBPJ and MPSJ. The situation in the MPS is difficult to anticipate because of its dynamic interaction with DBKL. However, in the future, the potential for the Gombak District to receive migration is high. This is due to the rapid development factors in Rawang and Selayang and thus will attract people's interest to move there.

The tendency of each spatial planning unit to receive migration in the future is based on net migration. The result of calculation of the net migration percentage is shown in Table 10. DBKL is one of the spatial planning units that undergo the net out-migration. This is due to the fact that this area has experienced high out-migration rather than in-migration since 1991. MPKj and MPAJ constitute among the two highest percentages of net in-migration, that is, 5.22% and 3.99% respectively. MPK, MBPJ, MPSJ and MBSA record nearly a similar net in-migration. The MPS records a low net in-migration compared to other areas. The scenario for the pattern of migration flow between spatial planning units is expected to continue into the next decades.

Table 10: The net migration for each spatial planning unit in the Klang Valley, 2000.

Spatial Planning Units	Net Migration 2000	
	%	Level/Forms
DBKL	-11.15	Negative
MPS	1.06	Low
MPAJ	3.99	Very high
MBSA	1.95	Low
MBPJ	2.35	Intermediate
MPSJ	2.37	Intermediate
MPK	2.53	Intermediate
MPKj	5.22	Very high

Note: DBKL=Kuala Lumpur City Hall; MPS=Selayang Municipal Council; MPAJ=Ampang Jaya Municipal Council; MBSA=Shah Alam City; MBPJ=Petaling Jaya City; MPSJ=Subang Jaya Municipal Council; MPK: Klang Municipal Council; MPKj: Kajang Municipal Council.

4. CONCLUSIONS

This paper has described the application of the MCM for measuring the spatial migration focusing in the Klang Valley region. From the discussion, the summary of the relevant findings is as follows:

a) the migration trend in the Klang Valley tends to focus on the areas outside FT Kuala Lumpur;

b) currently, the Hulu Langat District records the highest focus of migration flows. The flow is expected to continue into the coming decades;

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c) other districts such as Klang, and Gombak districts still have the potential of being focused migration flows in future. This is as the result of burgeoning development there and new development in their fringe areas;

d) in the Hulu Langat District, MKPj recorded the highest focused migration flows. This is followed by MPAJ. This scenario of migration flows is expected to continue for the coming decades;

e) other spatial planning units which have an intermediate focus of migration flows are MPSJ and MPK which are located in the Petaling District and Klang District respectively. Besides that, the MPS also has the potential of being the focus of migration flows in the future;

f) it looks like there are variations in the forms of migration flows in the Klang Valley, that is, very high, intermediate, low, and negative; and

g) overall, all the areas of the Klang Valley have the potential of being the focus of migration flows in the future but with different degrees of focus.

These relevant findings of course would give the implications and guidance to urban planning process in the Klang Valley. It means that the migration phenomena need to be given special attention because of their very important role in urban development planning. The information of areas that have the potential to receive a big number of migration needs to be outlined and supported with perfect urban planning in terms of physical, economic and social planning and support services.

Overall, the measurement of migration based on the MCM has successfully explained the trends and migration distribution in the Klang Valley. Thus, this model is appropriate to be used for analysing migration systems especially in urban areas. Nevertheless, the outcomes of this measurement are still at a macro level, not at the migration behavioural analysis level (or micro level). This situation needs other methods which can explain the flow of migration distribution based on behavioural migration analysis because urban growth factor alone is not sufficient to explain the real dynamics of migration streams. There are a lot of other factors that impact migration behaviours (or migration decision-selectivity). In addition, migration data based on census are very limited and cannot explain unique behaviour and migration distribution in urban areas in a more detailed way.

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