AN ANALYSIS OF THE LOCATION OF PLASTIC INDUSTRY IN THAILAND

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Abstract- The purposes of this research are to analyze locational patterns of the plastic industry in Thailand, and to examine the factors influencing its location. The data used in the analysis were the secondary data recorded in 2015. The techniques and methods for the analysis were the cartographic method, the correlation analysis, and the multiple regression analysis. The results of this research are as follows: With regard to the locational pattern of plastic industry in Thailand by geographical region, it is found that Samut Prakan has the greatest number of plastic bead industrial sites in Thailand, used 54.12 billion Bahts investment or 52.59% of total investment in this industry. Followed by Rayong with 25.33 billion Bahts or %24.62 of total investment. Third is Phra Nakhon Si Ayutthaya with 7.45 billion Bahts or 7.25% of total investment. Forth is Chon Buri with 3.07 billion Bahts or 2.99% of total investment. Fifth is Pathum Thani with 2.35 billion Bahts or 2.29% of total investment. For the least number of industrial sites in Thailand is Si Sa Ket, used 9 billion Bahts or 0.09% of total investment in plastic bead manufacturing industry. The results of analyzing the factors influencing the location of plastic industry in Thailand, it is found that the location of plastic industry was significantly (α=0.05) correlated the most with the market factor(r=0.655), followed by the capital factor(r=0.314), the transport factor(r=0.058), the material factor (r=0.036), and the labor factor (r=0.002) respectively. For the multiple regression analysis it was found that the market factor was the single most important factor influencing the location of the plastic industry in Thailand. However, the market factor was only the factor which explained the variation of the location of plastic industry by 65.50%. The multiple regression model was $\hat{Y} = 361.797 + 0.316market$

Keywords- locational pattern, the factors influencing the location, the plastic industry in Thailand

I. INTRODUCTION

At present, Thai economic system has reach to the point of production structural changes from emphasizing on massive labor work to the production that needs scientific and technological knowledge to expand competitive capability.[1] Since there is a pressure on higher labor market demand, it declines labor-intensive industry competition tendency in Thailand.

From aforementioned situation, plastic industry becomes one of anticipating target industry to be well- with changing production structures. Thailand's plastic industry consists of plastic beads and products manufacturing. Plastic bead is a high investing and technological demand industry while plastic products are the production in small to medium sized factories with more than 200 manufacturers.

Therefore, plastic industry becomes one of important industrial branches for country development and makes profit more than $1 billion per year in which there is constantly more demand on plastic bead along with the industry extension, interested Thai Board of Investment(BOI) to promote domestic plastic bead manufacturing.

For trading in 2015, From the reference [2] indicated that Thailand exported plastic bead with value of 278.33 billion Bahts, Most of export markets are within Asia regions such as, China, Indonesia and Vietnam with export value of 91.41 billion Bahts, 22.10 billion Bahts and 20.10 billion Bahts respectively. Plastic industry plays big role in Thailand export as a result of simultaneous development in upstream and downstream petrochemical products manufacturing, where previously only emphasizing on downstream manufacturing. With non- intensive labor upstream manufacturing affecting number of employment to be quite low, employment is now on a basis of applying science and technology knowledge that brings income to the country from high value business yield, reduce internal trade deficit, conforming and responding to dynamic manufacturing structure change of Thai economy along with extension of competitive capability in upstream manufacturing industry that fluctuates equally to production assets, in term of materials and energy, domestic market size, including establishment of neighbor countries trade which affect expanding demands and production development need of manufacturers to fulfill the market. In long term, manufacturers would be proficient enough to develop capability of each plastic industry sector, bringing equality and ability to compete in global market.

As above mentioned, we can see the importance of plastic industry for economic system, creating profit for investors and the nation, as well as establishing other industries' continuous manufacturing structures, inviting other industrial business people to invest in Thailand and compatible in Reference [3] shows the location of trading activities of surrounding area has direction of relationship which reflects on customers decision. This can create better benefits to the entrepreneur. With this reason, there are doubts of the manufacturing sites in Thailand and which factor

affects sites' location. All of these are duties of industrial geographer to do research and analyze plastic industrial site forms in Thailand. If the places are located correctly, industrial business people will succeed their aims, gaining highest profits and Thailand's economy will be flourished.

II. DETAILS EXPERIMENTAL

2.1 Objectives of study

1. Study to locational pattern of plastic industry in Thailand.
2. Analyze factors influencing the location of plastic industry in Thailand.

2.2 Scope of study

In this research, researcher studies only around the plastic industrial areas established within 22 provinces as Spatial Framework for research, segregating into each geographical area.

2.3 Methodology and Data Analysis

This study was renewal of data dividing to 2 steps as follow

1. study to locational pattern of plastic industry in Thailand, by studying from investment in plastic manufacturing industry in 2015 and used data to divide in province data, in 3 levels to indicate site location of each area as abundant, moderate, and least for studying format of distribution, the result of study will reveal in the form of table and map using Cartographic Method by ArcGIS program defined by [4]
2. study and analyze factors influencing the location of plastic industry in Thailand.

- study factors that have influenced to investment in plastic manufacturing industry in Thailand, using data to be in the statistic form to calculate correlation of variances used in positive, negative or non-correlation.
- analyze multiple regressive analysis, to use in factor influencing the location of plastic industry in Thailand, for amount of investing budget in plastic manufacturing industry are Dependent Variable, remaining factors are Independent Variable which will be used to find factors as follow [5-8] :

Y = size of provincial investing budget of plastic industry which indicates that in 2015 to be criterion.

X_1 = labor factors using the laborers between 15-59 years of age as criterion in measurement

X_2 = material factors using capital investment in Petrochemical manufacturing industry (Plastic substrate) as criterion in measurement

X_3 = capital factors using bank credit loans as criterion in measurement

X_4 = transport factors using the number of trucks and pick-up trucks that are registered according to The Land Transport Act B.E.2522 used as criterion in measurement

X_5 = market factors using Gross Provincial Product (GPP) as criterion in measurement

3. statistic and quantity technique used in data analysis[9]

- Correlation Analysis used to find coefficient, Pearson-Product Moment Correlation Coefficient as follow (1):

$$r = \frac{n(\sum XY)-(\sum X)(\sum Y)}{\sqrt{[N(\sum X^2)-(\sum X)^2]*[N(\sum Y^2)-(\sum Y)^2]}} \quad (1)$$

where:

r = correlation between variableXY
$\sum X$ = total result data from variableX
$\sum Y$ = total result data from variableY
$\sum XY$ = data fromX and Y
$\sum X^2$ = total data of bothdata from X
$\sum Y^2$ = total data of both data from Y
N = amount of data

- Analyze Multiple Regression Analysis by Stepwise method as follow (2):

$$Y = b_0 + b_1x_1 + b_2x_2 + \ldots b_nx_n + e \quad (2)$$

where:

Y = followed variables
b_0 = fix value
$b_1 - b_n$ = regression coefficient
e = inconsistent value

III. RESULTS AND CONCLUSIONS

1. Study to locational pattern of plastic industry in Thailand.

Researcher considered using provincial investing budget of plastic industry which indicates that in 2015, Samut Prakan has the greatest number of plastic industrial sites in Thailand, used 54.12 billion Bahts investment or 52.59% of total investment in this industry. Followed by Rayong with 25.33 billion Bahts or %24.62 of total investment.

Third is Phra Nakhon Si Ayutthaya with 7.45 billion Bahts or 7.25% of total investment. Forth is Chon Buri with 3.07 billion Bahts or 2.99% of total investment. Fifth is Pathum Thani with 2.35 billion Bahts or 2.29% of total investment.

For the least number of industrial sites in Thailand is Si Sa Ket, used 9 billion Bahts or 0.09% of total investment in plastic manufacturing industry as shown on Fig 1.

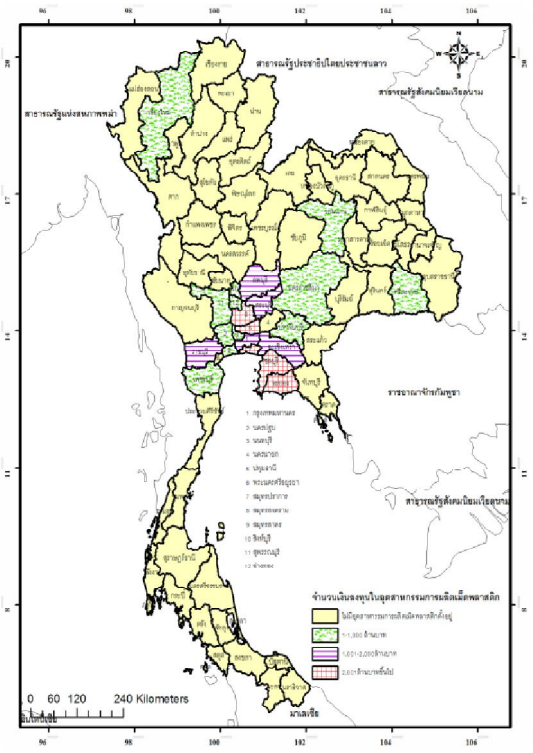


Fig. 1 Mapping of provincial investing budget of plastic industry which indicates that in 2015 as criterion for measurement

Site location analysis uses Cartographic Method, taking investing budget as industry size indicator. This can segregate into 3 levels to indicate site location of each area as abundant, moderate, and least. Results are: Five provinces with most abundant plastic industrial sites, invested 2 billion Bahts and above, are Samut Prakan, Rayong, Ayutthaya, Chon Buri and Pathum Thani. Five provinces with moderate plastic industrial sites, invested from 1 to 2 billion Bahts, are Bangkok, Chachoengsao, Lop Buri, Sara Buri, and Ratcha Buri. Twelve provinces with least plastic industrial sites, invested from 1 million to 1 billion Bahts, are Ang Thong, Prachin Buri, Samut Sakhon, Nonthaburi, Chiang Mai, Nakhon Pathom, Nakhon Ratchasima, Khon Kaen, Suphan Buri, Phetchaburi, Singha Buri, and Si Sa Ket.

2. Study and analyze factors influencing the location of plastic industry in Thailand

2.1 analyse coefficient in Pearson's Product Moment Correlation Coefficient:r(researcher used all variables to analyse coefficient by correlation technique in Pearson using in statistical open source software. The results are size of provincial investing budget of plastic industry is compatible to hypothesis; size of investing budget as positive correlation with with the market factor(r=0.655), followed by the capital factor(r=0.314), the transport factor(r=0.058), the material factor (r=0.036), and the labor factor (r=0.002) respectively as shown in Table I.

TABLE I COEFFICIENT IN PEARSON CORRELATIONS

	Y1	*X1*	*X2*	*X3*	*X4*	*X5*
Y1	1	0.002	0.036	0.314	0.058	0.655
Sig		0.993	0.872	0.155	0.797	0.001
N		22	22	22	22	22
X1		1	0.946	0.852	0.914	-0.105
Sig			0.000	0.000	0.000	0.642
N			22	22	22	22
X2			1	0.909	0.939	-0.025
Sig				0.000	0.000	0.913
N				22	22	22
X3				1	0.934	0.225
Sig					0.000	0.314
N					22	22
X4					1	-0.054
Sig						0.812
N						22
X5						1
Sig						
N						22

2.2 Multiple Regression Analysis in multiple regression analysis is used Stepwise Regression to select variables that the market factor is only one to regressive summation, and has coefficient of Multiple Correlation or R value equals to 0.655 or R^2 is equal to 0.429 which means market can explain the change or size alteration of investing budget to 65.50% of total value of factors. The remaining 34.50% came from other influences as shown in Table II.

TABLE II
MODEL SUMMARY IN MULTIPLE REGRESSION

Model	R	R^2	Adj R^2	Std.Eror
1	0.655	0.429	0.401	8.46550

TABLE III
COEFFICIENT IN MULTIPLE REGRESSION

Model	Unstandardized Coefficients		standardized Coefficients	t	Sig.
	B	Std. Eror	Beta		
Constant	361.797	159.079		2.274	0.034
X5	0.316	0.082	0.655	3.878	0.001

From table III. showed Multiple Regression Coefficient:B of summation, is)b_0 (= 361.797 coefficient of variables X_5 market) b_1 (=0.316) therefore, regression summation will be as follow (3):

$$\hat{Y} = 361.797 + 0.316market \quad (3)$$

CONCLUSIONS

From the analysis of plastic industrial location site forms in Thailand by Cartographic Method, Pearson's Product Moment Correlation Coefficient and Multiple Regression Analysis indicates that Samut Prakan has most abundant industrial sites followed by neighbor provinces such as Rayong, Phra Nakhon Si Ayutthaya, Chon Buri Rayong, Ayutthaya, and Pathum Thani. The factor affects site location is area of market. In another word, provinces with high investment are the places with large market; make the industry to be interested in establishing in the areas of high demand, reflecting capability in manufacturing support. More capable in support means lesser the cost per unit for mass production as well as lesser

cost from manufacturing proficiency accumulation. Conversely, the provinces with low total investment on downstream production would have small market areas, leading to low industrial sites establishment in this area, especially the Central Business District (CBD) such as nearby provinces[10] like Rayong, Phra Nakhon Si Ayutthaya, Chon Buri Rayong, Ayutthaya, and Pathum Thani. Even with lower investment than Samut Prakan, but they still have higher investment than other provinces in the country; make them become second largest market. So, plastic industry is settled there to establish sites, conforming to industrial site location theory defined by [11] and compatible in Reference [12] shows the agglomerative effects of industrial structure and corporate organization is an issue that certainly warrants further study. Research results are believeable and based on the basic of this theory and able to be used for other benefits.

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