Research on Logistics Demand Forecast in Southeast Asia

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Abstract

This article predicts Southeast Asia's logistics needs from a Southeast Asian logistics development perspective. This is not only an important prerequisite for supporting Southeast Asia's trade policy, but also promoting the development of Southeast Asia's logistics industry, building logistics infrastructure and improving the level of logistics services. Due to differences in economic development levels, trade structures, infrastructure construction and logistics development levels of Southeast Asian countries. Therefore, considering the actual situation of Southeast Asian countries, this article selected 21 cities in Southeast Asia as the research object. Use L-OD logistics demand forecasting method to forecast logistics demand in Southeast Asia. Obtain the amount of logistics occurrence and attraction in 21 cities in Southeast Asia in the future. And construct a double constrained gravity model to predict logistics distribution in Southeast Asia. The forecast results provide scientific data support for future logistics development planning in Southeast Asia.

Keywords

Southeast Asian, Logistics, Demand Forecast, Double Constrained Gravity Model

1. Introduction

Following the regional integration of Southeast Asian, the international trade in the Southeast Asian region continues strengthening, and the Southeast Asian gradually becomes the fastest-growing region for exchange of goods. The rapid economic development and the rapid growth of trade have created a huge demand for the Southeast Asian regional logistics industry. Promote the rapid development of transportation, warehousing, distribution, loading and unloading, postal, telecommunications and other industries related to the logistics industry.

At present, the economic and logistics development levels of various cities in Southeast Asia are uneven, and there are great differences. Therefore, how to apply effective logistics forecasting methods has very important practical significance for the logistics development needs of various cities in Southeast Asia. For the forecast methods of logistics are a very rich field of research scholars. For many logistics demand forecasting methods, analyze from the macro and micro levels. At the macro level, some scholars analyzed the relationship between logistics demand and supply for research. From a micro level, Zhang Jin [1] proposed a streamlined network of demand and supply to build a suitability. Silva [2] uses nonparametric time series and singularity, forecasting technology to forecast freight volume and the prediction model of the economic recession. Wang [3] studied the utilization rate and application scope of different forecasting methods. Yu [4] forecasts the logistics needs of Yunnan Province. Set strategic goals for logistics companies in Yunnan Province to reduce costs and improve logistics efficiency. Tian [5] used the L-OD method to forecast logistics demand of Luzhou. However, at present, scholars have deepened the logistics network from the perspective of logistics demand development and logistics demand characteristics. There are few studies, and there are few studies in Southeast Asia. Based on the geographical location, economy, trade and logistics of cities in Southeast Asian countries. The 21 cities in Southeast Asia were selected as the research subjects which are the most economically developed and logistics developed in Southeast Asia. Mainly include: Singapore; Kuala Lumpur, Selangor, Perak, Johor, Pahang, Sarawak of Malaysia; Bangkok and Chonburi of Thailand; Jakarta, Java, Riau, South Kalimantan and East Kalimantan of Indonesia; Ha Noi, Da Nang and Ho Chi Minh of Viet Nam; Manila of Philippines; Vientiane of Laos; Phnom Penh of Cambodia and Yangon of Myanmar. Using the L-OD stage method for logistics demand forecasting. It predicts the occurrence of logistics in 21 cities in Southeast Asia, the distribution of attracted logistics and the direction of logistics. It provides theoretical basis and practical application value for the development of logistics in the Southeast Asia region, logistics planning, and the optimization of the logistics network.

2. Southeast Asia Regional Logistics Forecast

2.1. Logistics Area Division

Based on L-OD logistics demand forecasting, analysis of the total logistics in Southeast Asia, and includes various forecasting methods and models. The basic principle of the four-stage forecasting method is to first investigate the regional economy, the level of logistics development, and the logistics L-OD survey among the areas, etc. Then build a generative model according to the regional economic growth trend, and get the future regional logistics demand, namely logistics generation forecast, logistics distribution forecast, logistics network allocation, etc. This article considers the administrative divisions of Southeast Asian countries, the economic development of various countries, and the scope of rad-

iation to other regions, taking 21 cities in Southeast Asia as the research object. Singapore is area 1. Malaysia's Kuala Lumpur, Selangor, Perak, Johor, Pahang, Sarawak are areas 2, 3, 4, 5, 6, 7. Thailand's Bangkok and Chon Buri are areas 8 and 9. Indonesia's Jakarta, Java, Riau, South Kalimantan and East Kalimantan are areas 10, 11, 12, 13, 14. Vietnam's Hanoi, Da Nang, and Ho Chi Minh are areas 15, 16, and 17. Philippines's Manila is area 18. Myanmar's Yangon is area 19. Cambodia's Phnom Penh is area 20. Lao's Vientiane is area 21.

2.2. Key Model of L-OD Prediction Method

1) Elastic coefficient method

In this paper, the elastic coefficient method is used to predict the material flow. Considering that the growth of total logistics volume is related to GDP, the elasticity coefficient is set as the ratio of the growth rate of total logistics volume to the growth rate of GDP. The specific model is shown below.

$$\alpha^k = \eta^k / \gamma^k, k = 1, 2, \cdots, 21. \tag{1}$$

$$L_t^k = L_0^k \left(1 + \eta^k\right)^{\Delta t}, k = 1, 2, \cdots, 21. \tag{2}$$

$$P_t^k = a_t^k \cdot L_t^k, k = 1, 2, \cdots, 21. \tag{3}$$

$$A_t^k = b_t^k \cdot L_t^k, k = 1, 2, \cdots, 21. \tag{4}$$

In the formula: α^k: the elasticity coefficient of the kth logistics area;

η^k: the growth rate of the total logistics volume of the kth logistics community;

γ^k: GDP growth rate of the kth logistics community;

L_t^k: the total logistics volume of the kth logistics community in year t;

L_0^k: he predicted total logistics volume of the kth logistics district in the base year;

Δt: predicted years;

a_t^k: the weight of logistics occurrence in the kth logistics community in year t;

A_t^k: the logistics attraction of the kth logistics community in year t;

b_t^k: the weight of logistics attraction of the kth logistics community in year t.

2) Double constrained gravity model

In this paper, the dual-constrained gravity model method is used to predict logistics distribution. This method can better reflect the logistics distribution of the community and its social relationship with the economy, land use, and comprehensive transportation. The model is:

$$d_{ij} = k \frac{F_i X_j}{R_{ij}} \tag{5}$$

The dual-constrained gravity model satisfies:

$$\sum_i D_{ij} = X_j, \sum_i D_{ij} = F_i \tag{6}$$

The two constraints, the basic form is:

$$D_{ij} = A_i B_j X_j F_i R_{ij} \tag{7}$$

$$A_i = \left[\sum_j B_j F_i R_{ij} \right]^{-1} \quad (8)$$

$$B_j = \left[\sum_i A_i X_i R_{ij} \right]^{-1}$$

The logistics distribution prediction is expressed by the impedance distance:

$$R_{ij} = k_{ij}^{-\alpha} \quad (9)$$

In the formula: D_{ij} is the distribution of logistics from area i to area j;

F_i is the volume of logistics generated in area i;

X_j is the logistics attraction of area j;

D_{ij} is the logistics impedance of area i to area j;

A_i, B_j is the fitting coefficient;

k_{ij} is the distance from area i to area j;

α is the undetermined coefficient.

2.3. Logistics Forecast Results

1) Forecast of Southeast Asia Logistics Volume

Southeast Asia's future logistics forecast is the region's cargo volume forecast. According to the statistics of different countries, the volume index is chosen to represent the logistics development of Southeast Asia countries. Use the elasticity coefficient method to predict the volume of goods in the Southeast Asia region. Through the statistical yearbook and statistical bulletin data of Southeast Asian countries, the logistics occurrence and attraction among Southeast Asian cities (Table 1).

Then the elasticity coefficient method is used to predict the logistics occurrence and attraction of 21 cities in Southeast Asia (Table 2).

In 2025, the occurrence and attraction of logistics in 21 districts in Southeast Asia are shown in Figure 1.

Use the double constrained gravity model to obtain the logistics distribution forecast lines of 21 regions in Southeast Asia in 2025, as shown in Figure 2.

As can be seen from Figure 1, the logistics attraction and occurrence of 21 areas in Southeast Asia are basically the same. Among them, Singapore (area 1) and Thailand (areas 8 and 9) have a relatively large amount of logistics occurrence and attraction, while Myanmar (area 19) and Laos (area 21) have a relatively small amount of logistics occurrence and attraction.

From the analysis of the distribution prediction results in 2025, we can conclude that:

- For the ASEAN region, the distribution of logistics is mainly concentrated in area 1 of Singapore, area 2 and area 3 of Malaysia, area 8 of Thailand, area 10 of Indonesia, area 17 of Vietnam.
- Thailand (area 8 and 9) and Cambodia (area 20) have relatively large exchange volumes. Singapore (area 1) and the Philippines (area 18) have relatively large exchange volumes.
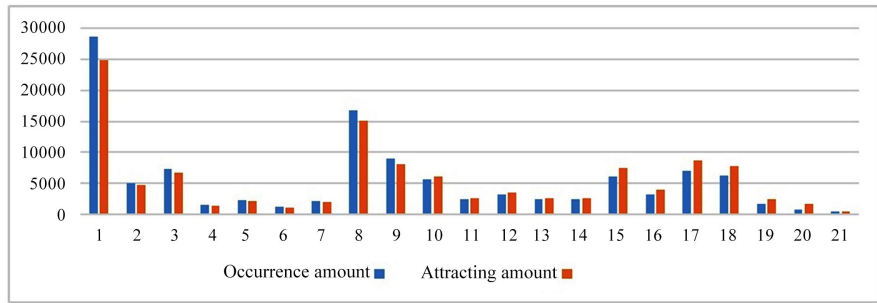
Figure 1. 2025 Logistics occurrence and attraction in 21 areas in Southeast Asia (100,000 tons).
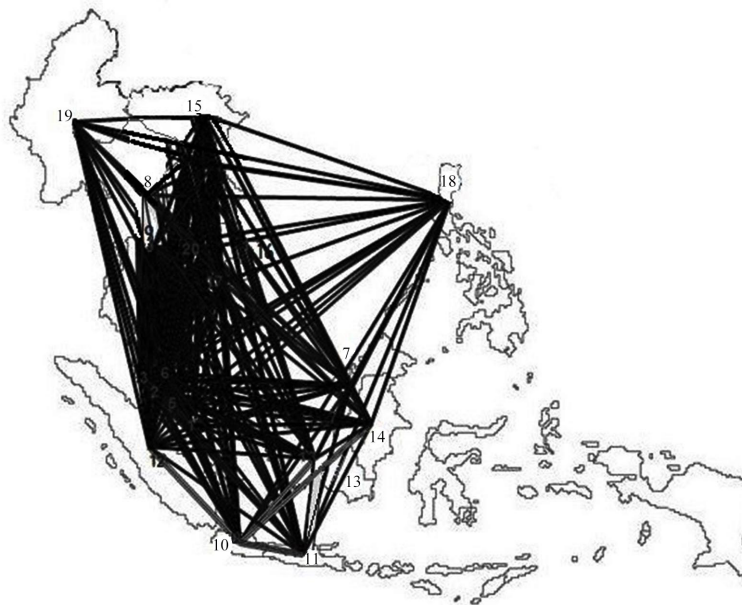

Figure 2. Expected line graph of material flow distribution in 2025.

Table 1. 2015 Logistics occurrence and attraction of Southeast Asian (Unit: 100,000 tons).

Area number	Occurrence amount	Attracting amount	Area number	Occurrence amount	Attracting amount
1	20251	17,590	12	1809.6	1947.6
2	3275.7	3012.6	13	1358	1462
3	4712	4333.5	14	1356.4	1459.4
4	957.5	880.6	15	3375	4170
5	1499.3	1378.9	16	1824	2254
6	781.1	718.3	17	3923	4846
7	1373.3	1263	18	3861	4745
8	8121.7	7347.6	19	1012	1549
9	4373.3	3956.4	20	2401	859
10	3166.8	3408.3	21	352	280
11	1357.2	1460.7			

Table 2. 2025 Logistics occurrence and attraction of Southeast Asian (Unit: 100,000 tons).

Area number	Occurrence amount	Attracting amount	Area number	Occurrence amount	Attracting amount
1	28,562	24,810	12	3239	3487
2	5087	4678	13	2431	2618
3	7317	6729	14	2427	2613
4	1487	1368	15	6042	7465
5	2329	2141	16	3265	4034
6	1213	1116	17	7022	8675
7	2133	1961	18	6286	7726
8	16,722	15,129	19	1647	2522
9	9005	8146	20	4721	1689
10	5669	6101	21	546	434
11	2430	2615			

- The occurrence and attraction of Singapore (area 1) accounted for more than the rest of the Southeast Asian region. It shows that Singapore is the regional logistics hub of Southeast Asian, which concentrates the main part of Southeast Asian regional logistics exchange volume. Selangor in Malaysia (area 3), Bangkok in Thailand (area 8), Ho Chi Minh in Vietnam (area 17), and Jakarta in Indonesia (area 10) are the second largest in terms of occurrence and attraction, with a rapid growth rate.

3. Southeast Asia Regional Logistics Network Traffic Distribution

Through the logistics forecast results of various regions in Southeast Asia. It can be seen that the flow of freight in Southeast Asia. Among the 21 cities in Southeast Asia, Singapore is the logistics hub, radiating the cities in the entire Southeast Asian region. On the Southeast Asian Peninsula, Thailand is the main center of radiation to Vietnam (Hanoi), Philippines (Manila), Myanmar (Yangon), Cambodia Phnom Penh) and Laos (Vientiane). Southeast Asia peninsula mainly radiates Malaysia (Sarawak) and Indonesia (Jakarta, Java, South Kalimantan, East Kalimantan, Riau) centered on Singapore and Indonesia (Table 3).

At present, the logistics infrastructure of countries in Southeast Asia is unbalanced. The cargo transportation mode is unreasonable, and the main cargo transportation is concentrated on water transportation. And the unbalanced freight volume between Southeast Asia. Therefore, corresponding countermeasures and suggestions are proposed for the Southeast Asian logistics network. While Southeast Asian countries continue to strengthen domestic infrastructure construction, they should also increase cooperation among countries, infrastructure interconnection construction. Southeast Asian countries including

Table 3. Logistics exchange volume between Southeast Asia.

ASEAN region	Major countries in logistics exchange volume
Singapore	Malaysia (Selangor, Kuala Lumpur) > Indonesia (Jakarta) > Thailand (Bangkok)
Malaysia	Thailand (Bangkok, Chonburi) > Indonesia (Jakarta)
Thailand	Singapore > Malaysia (Selangor, Kuala Lumpur) > Vietnam (Ho Chi Minh, Hanoi)
Indonesia	Singapore > Philippines
Vietnam	Singapore > Thailand (Bangkok) > Laos (Vientiane)
Philippines	Singapore > Thailand (Bangkok)
Myanmar	Singapore > Thailand (Bangkok)
Cambodia	Thailand (Bangkok) > Vietnam (Ho Chi Minh)
Laos	Thailand > Vietnam (Hanoi)

Vietnam, Indonesia, the Philippines, Myanmar, Cambodia, and Laos have weak and backward railway networks. It is necessary to strengthen the construction of the railway network, and at the same time improve the highway network and improve the quality of highway grades.

4. Conclusions

This article focuses on Southeast Asia's economic, trade and logistics analysis to study Southeast Asia's logistics demand. Using the L-OD logistics demand forecasting method.

Southeast Asia is divided into 21 communities then the logistics occurrence, attraction and logistics exchange volume of Southeast Asian countries are predicted. The prediction results show that compared with other Southeast Asian regions, the occurrence and attractiveness of Singapore (area 1) account for a large proportion, which shows that Singapore is the logistics hub of Southeast Asia, and concentrates the main part of the Southeast Asia regional logistics exchange volume. Selang in Malaysia (area 3), Bangkok in Thailand (area 8), Ho Chi Minh City in Vietnam (area 17) and Jakarta in Indonesia (area 10) are the second largest. However, Myanmar's Yangon (area 19), Cambodia's Phnom Penh (area 20), and Indonesia's Jakarta (area 10) have less domestic freight exchanges. This result has important implications for regional economic development in Southeast Asia, the development of the logistics industry and the logistics services.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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