

China-ASEAN International Logistics Development Strategy

Tian Fang*

*Corresponding author: fangtianrioh@163.com

Research Institute of Highway Ministry of Transport, Beijing, 101088, China

Abstract: With the increasingly complex international situation, ASEAN is becoming more and more important to China in international trade status, and logistics development is the basis for the development of international trade. Based on the development of ASEAN's economy, the basic situation of China-ASEAN trade and the basic situation of ASEAN's international logistics development, this paper sets up an impact factor model of China ASEAN international logistics network, combines the logistics service quality level of ASEAN countries, adopts a combination of qualitative analysis and quantitative analysis, and puts forward policy recommendations for China ASEAN international logistics network.

Keywords: China-ASEAN, International Logistics, Demand Forecast, Comprehensive Transportation.

1 INTRODUCTION

ASEAN is the abbreviation of the Association of Southeast Asian Nations (ASEAN). Since its establishment in Bangkok in 1967, ASEAN has ten member countries, including Indonesia, Malaysia, the Philippines, Singapore, Thailand, Brunei, Vietnam, Myanmar, Laos and Cambodia, with a total area of about 4.52 million square kilometers and a population of 660 million, accounting for 8.6% of the world's total population. As a close neighbor and an important partner of China, ASEAN's trade and investment have grown against the backdrop of the downturn in the world economy. For the second consecutive year, ASEAN has become China's largest trade partner, with closer economic ties and closer industrial ties between the two sides. Smooth logistics is an important guarantee for trade development, so it is of great research value to study and promote the establishment of China ASEAN international logistics development strategy.

The research content of logistics development strategy at home and abroad is relatively rich, and the principal component analysis method used in this paper is also one of the main research methods. However, in the current logistics research for ASEAN, some studies select major cities as the perspective to study urban logistics nodes^[1], but the author believes that the strategic suggestions for logistics development between China and ASEAN should be considered as a whole country. At the same time, in the research of logistics development strategy, scholars

mostly adopt quantitative research methods, but the combination of ASEAN development strategy and the current situation of China and ASEAN international logistics development is insufficient. Therefore, this paper proposes policy recommendations to promote the development of international logistics between China and ASEAN by combining quantitative research with qualitative research, combining macro policy requirements and micro logistics development.

2 FACTORS AFFECTING CHINA ASEAN INTERNATIONAL LOGISTICS

2.1 Economic Development of ASEAN Countries

According to the statistics of the World Bank, the ASEAN economy has shown a steady growth trend in recent years. The total economic volume of ASEAN has increased from 260 million dollars in 2016 to 340 million dollars in 2021, accounting for about 3.5% of the total world economy. Although affected by adverse factors such as the COVID-19, the manufacturing purchasing managers' index (PMI) of ASEAN member countries continues to be in the expansion range. ASEAN countries are highly dependent on foreign trade and the volume of foreign trade in goods accounts for more than half of GDP in most countries.

The economic strength of the ten ASEAN countries is uneven, with a huge gap in GDP and per capita GDP, as well as the import and export trade volume of each country. On the whole, except Malaysia, the economic development of countries in Indochina Peninsula is relatively backward, and the old ASEAN member countries including Indonesia, Thailand, the Philippines, Singapore and Malaysia rank in the top five. In recent years, the total GDP of these five countries accounts for more than 80% of the total GDP of ASEAN.

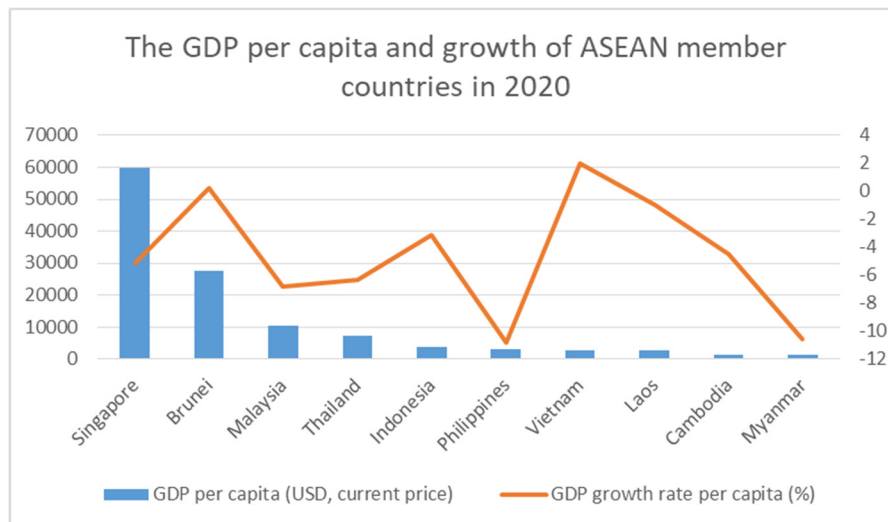


Figure 1. The GDP per capital and growth of ASEAN member countries in 2020

The industrial structure of ASEAN member countries is quite different. According to the data of the World Bank, in 2020, Singapore's service industry accounted for 71% of GDP, exceeding the world average (about 65%), and Thailand and Malaysia's service industry accounted for nearly or more than 55% of GDP. The proportion of industrial added value in GDP is higher than the world average (about 25%) in all 9 member countries except Singapore. Brunei's industrial added value accounts for more than 59% of GDP. Except Singapore and Brunei, the proportion of agricultural added value in GDP of other 8 member countries is significantly higher than the world average (about 3.6%), and the proportion of agricultural added value in GDP of Cambodia and Myanmar is nearly 23%.^[2]

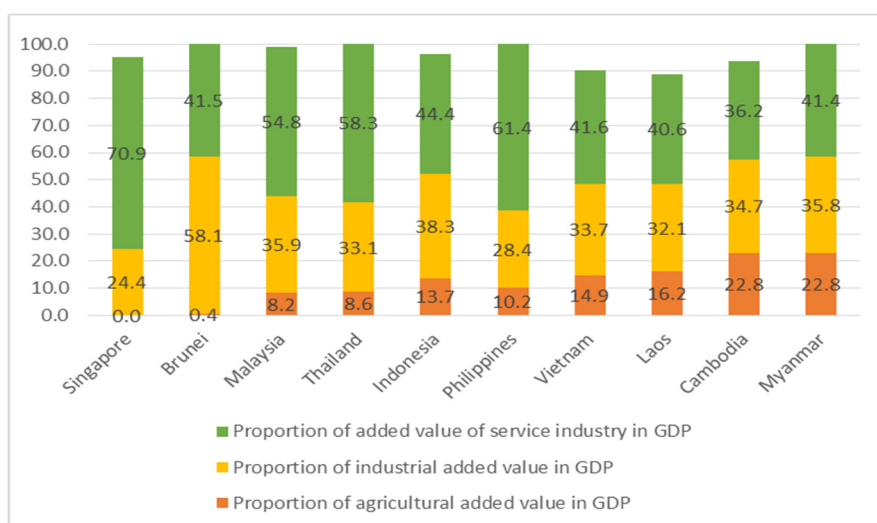


Figure 2. The industry structure of ASEAN member countries in 2020

2.2 Basic Situation of China ASEAN Trade

After China put forward the "the Belt and Road" initiative, ASEAN is the most important fulcrum region and cooperative partner of the "the Belt and Road", and bilateral trade between China and ASEAN also shows a trend of continued rapid growth. In 2021, the volume of goods trade between China and ASEAN will reach 878.2 billion US dollars, with a year-on-year growth of 28.1%. Vietnam, Malaysia and Thailand are China's top three trading partners in ASEAN. The implementation of China ASEAN Free Trade Agreement and RCEP Agreement has further consolidated the economic relationship between China and ASEAN.

There are significant gaps among ASEAN member countries. In terms of countries, Vietnam, Malaysia and Thailand are China's top three trading partners in ASEAN. In 2020, the bilateral trade in goods between China and Vietnam reached 1922.8 US dollars, with a year-on-year growth of 18.7%, accounting for 28.0% of the total trade in goods between China and ASEAN in the same period. Malaysia followed closely, with a trade volume of 131.16 billion US dollars in 2020, up 5.7% year on year. The trade between Thailand, Singapore, Indonesia and the Philippines has developed steadily, while the trade volume between Myanmar, Cambodia, Laos,

Brunei and China is relatively low. From the perspective of trade trend, China's trade with other ASEAN countries is growing, except for the decline in trade with Laos, Indonesia and Singapore.

2.3 Basic Situation of ASEAN International Logistics Development

The functional positioning of different ASEAN regional networks bears different quantities of goods. At present, the ASEAN region is mainly engaged in the transportation of goods by sea, mainly bulk cargo transportation, which is responsible for about 80% of ASEAN's cargo volume. The second is road transportation. The main road ports of Vietnam, Laos, Cambodia, Thailand and Myanmar on the border are all connected by roads, but most of the roads are low grade, mostly Class III and Class IV roads. The railway transportation is being improved in the ASEAN Peninsula countries, mainly responsible for the transportation of industrial raw materials. Due to high cost and small proportion of transportation volume, air transport mainly transports high value-added products.

ASEAN attaches great importance to the transport connection between internal countries. In the 2025 ASEAN General Plan for Connectivity (2016) and other documents^[3], ASEAN has made a strategic layout for strengthening the connectivity between countries in terms of aviation, maritime transport, roads, railways, etc. At the same time, ASEAN countries have improved the transport convenience and unity among countries through the ASEAN Framework Agreement on Facilitation of Freight Transport (AFAFGIT), the ASEAN Framework Agreement on Facilitation of Transport among Countries (AFAFIST) and the ASEAN Framework Agreement on Multimodal Transport (AFAMT).

3 CONSTRUCTION OF CHINA ASEAN INTERNATIONAL LOGISTICS NETWORK

3.1 Analysis on the Influencing Factors of China Asean International Logistics Network

According to the above analysis, determine the indicators that affect the logistics level of ASEAN countries, mainly including the comprehensive development level of the country, the overall logistics demand of the country, the logistics demand of China and the level of comprehensive logistics facilities. Then, determine the correlation degree of corresponding evaluation indicators, and select 16 factors with high correlation degree as evaluation indicators. The specific evaluation indicators are shown in the following table.

Table 1. China ASEAN international logistics network influencing factors

Level I indicators	Secondary indicators	Third level indicators
National comprehensive development	Economic development	GDP (100 million US dollars) (X1) GDP per capita (100 million US dollars) (X2)
	Development of tertiary industry	Agricultural added value (100 million US dollars) (X3) Industrial added value (100 million US dollars) (X4)

		Added value of manufacturing industry (100 million US dollars) (X5)
Overall demand of national logistics	Cargo logistics demand	Trade in imported goods (100 million US dollars) (X6)
	Service trade logistics demand	Export goods trade (100 million US dollars) (X7) Import service trade (100 million US dollars) (X8) Export service trade (100 million US dollars) (X9)
Logistics demand between China and ASEAN	And the overall trade level of China	Chinese exports (100 million US dollars) (X10) Chinese imports (100 million US dollars) (X11) Chinese investment (100 million US dollars) (X12)
	China's economic influence	
Logistics complex facilities	General situation of logistics	Highway mileage (kilometer)(X13) Railway mileage (kilometer) (X14) Port container throughput (10000 standard containers) (X15) Air cargo turnover (10000 ton km) (X15)

Table 2. China ASEAN international logistics network influencing factors

country	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16
Vietnam	34.08	34.99	40.3.8	91.4.5	45.2.7	26.13.1	28.14.4	18.3.9	21.6	97.8.7	64.1.3	13.8	47.00.0	31.60	16.37.4	48.13.7
Thailand	50.19	71.90	43.2.5	17.59.5	13.66.8	20.77	23.13.9	46.7.9	31.7	45.5.9	46.1.6	8.2	70.18.47	46.45	11.18.5	26.66.26
Myanmar	81.3	15.27	17.3.9	27.2.6	17.0.1	17.9.5	16.8.1	32.5	42.2	12.3.1	63.9	2.6	41.90.0	61.12	12.8.8	47.4
Laos	19.1	26.26	31	61.4	14.6	50.1	50.9	4.5	3.5	17.6	21.6	12.4	43.60.4	3.5	0	15.3
Cambodia	26.0	16.55	58.7	89.4	41.9	18.9.7	17.4.1	20.2	17.7	79.8	14.5	9.1	78.26.1	65.5	74.2	68
Malaysia	33.83	10.27.0	27.6.3	12.08.9	75.1	18.97.3	23.39.3	33.3.2	22.0.3	52.1.3	71.8.3	10	23.70.00	18.33	24.95.6	14.04.41
Philippines	36.22	33.30	36.8.2	10.26.6	63.8.8	90.7.6	63.8.8	18.3.3	31.4.1	40.7.5	20.2	1.4	20.00.00	50.0	86.3.8	83.59.1
Singapore	34.00	58.90.2	1.1.5	81.6.7	68.9	32.96	37.48.2	17.27.6	18.76.4	54.7.2	35.2.2	66.3	35.00	22.8	36.60	51.94.90
Indonesia	10.59.6	39.22	14.50.5	40.49.7	21.04	14.15.7	16.33.1	24.5	14.9.1	45.6.4	34.0.6	19.8	34.00.00	64.58	12.85.3	11.31.91
Brunei	12.0	26.08.9	1.4	71	19	53.4	66.1	12.1	3.5	6.5	4.5	5.7.7	37.08	0	13.9	12.93.5

The characteristic root is obtained according to the correlation coefficient matrix. Based on the principle that the characteristic root is greater than 1, the first three principal components are extracted. At the same time, it can be seen from the table that the cumulative contribution rate of the first three principal components is 90.4%, indicating that 90% of the data information is reflected. Calculate the initial factor load of principal components to find out the indicator information reflected by each principal component.

Table 3. Total variance decomposition principal component extraction analysis table

Composition	Characteristic value	Percentage of component variance in total variance (%)	Cumulative percentage of variance of each component in total variance (%)
1	8.075	50.47	50.47
2	4.934	30.84	81.306
3	1.456	9.10	90.403
4	0.74	4.63	95.031
5	0.453	2.83	97.865
6	0.166	1.04	98.905
7	0.103	0.64	99.548
8	0.071	0.44	99.992
9	0.001	0.01	100
10	0.00	0.00	100
11	0.00	0.00	100
12	0.00	0.00	100
13	0.00	0.00	100
14	0.00	0.00	100
15	0.00	0.00	100
16	0.00	0.00	100

It can be seen from Table 4 that the first principal component has a high load at X6, X7, X8, X9, X12, X15 and X16. The second principal component mainly reflects the information of X1, X2, X3, X4, X5 and X14, and the third principal component mainly reflects the information of X10 and X11. Therefore, extracting three principal components can basically reflect the information of all components

Table 4. Initial factor load matrix of principal component

Indicators	Initial factor		
	1	2	3
X1	0.648	0.699	0.231
X2	0.572	-0.703	0.3
X3	0.346	0.861	0.232
X4	0.552	0.762	0.282
X5	0.649	0.699	0.278
X6	0.949	-0.08	-0.284
X7	0.952	-0.083	-0.269
X8	0.834	-0.492	0.214

X9	0.777	-0.568	0.208
X10	0.742	0.205	-0.568
X11	0.713	0.273	-0.608
X12	0.747	-0.521	0.298
X13	0.317	0.651	0.054
X14	0.188	0.758	0.077
X15	0.927	-0.243	-0.152
X16	0.875	-0.34	0.216

Utilizing the primary component initial factor load matrix and standardized data, the expressions of the first principal component F1, the second principal component F2 and the third principal component F3 are calculated respectively, and the ratio of the corresponding eigenvalue of each principal component to the sum of the extracted principal component eigenvalue is used as the weight to calculate the principal component comprehensive model, as shown in the following expression.

$$F=0.558F1+0.341F2+0.101F3$$

Taking the first principal component as an example, the formula for calculating the principal component is as follows:

$$F1=\sqrt{8.075}*(0.648*ZX1+0.572*ZX2+0.346*ZX3+0.552*ZX4+0.649*ZX5+0.949*ZX6+0.952*ZX7+0.834*ZX8+0.777*ZX9+0.742*ZX10+0.713*ZX11+0.747*ZX12+0.317*ZX13+0.188*ZX14+0.927*ZX15+0.875*ZX16)$$

Table 5. Ranking table of principal component scores of each country

countries	F1	F2	F3	F
Vietnam	10.504	2.445	-3.651	6.330
Thailand	14.491	9.355	-0.021	11.278
Myanmar	-20.543	1.102	0.365	-11.055
Laos	-24.141	-5.205	0.476	-15.204
Cambodia	-22.878	-4.061	0.286	-14.128
Malaysia	10.893	1.543	-2.204	6.385
the Philippines	-6.456	1.680	-0.087	-3.040
Singapore	43.574	-20.751	1.470	17.395
Indonesia	17.495	21.264	2.491	17.270
Brunei	-22.939	-7.372	0.876	-15.232

It can be seen from the scores in the table above that Singapore and Indonesia scored much higher than other ASEAN countries, followed by Thailand, Malaysia and Vietnam. Other ASEAN countries scored lower.

3.2 Analysis of Logistics Service Quality in ASEAN Countries

Logistics development has been recognized as one of the core pillars supporting trade development. The National Logistics Performance Index (LPI) jointly proposed by the World Bank and the Turku School of Economics in Finland is an accurate and reliable evaluation system. The LPI index ranges from 1 to 5. The higher score means the better performance.

Table 6. Ranking table of principal component scores of each country^[4]

country	Country ranking	Overall score	Customs efficiency	Infrastructure	International transportation	Logistics quality	Goods tracking query	Transportation timelines
China	26	3.61	3.29	3.75	3.54	3.59	3.65	3.84
Vietnam	39	3.27	2.95	3.01	3.16	3.40	3.45	3.67
Thailand	32	3.41	3.14	3.14	3.46	3.41	3.47	3.81
Myanmar	137	2.30	2.17	1.99	2.20	2.28	2.20	2.9
Laos	82	2.70	2.61	2.44	2.72	2.65	2.91	2.84
Cambodia	98	2.58	2.37	2.14	2.79	2.41	2.52	3.16
Malaysia	41	3.22	2.90	3.15	3.35	3.30	3.15	3.46
Philippines	60	2.90	2.53	2.73	3.29	2.78	3.06	2.98
Singapore	7	4.00	3.89	4.06	3.58	4.10	4.08	4.32
Indonesia	46	3.15	2.67	2.89	3.23	3.10	3.30	3.67
Brunei	80	2.71	2.62	2.46	2.51	2.71	2.75	3.17
Average		3.024	2.785	2.801	3.029	3.014	3.089	3.398

From the perspective of the influencing factors of China ASEAN logistics network and the logistics service quality of ASEAN countries, the overall level of Singapore, Indonesia, Thailand, Malaysia and Vietnam is high, while the development level of the Philippines, Myanmar, Cambodia, Laos and Brunei is low.

4. STRATEGIC SUGGESTIONS ON CHINA ASEAN INTERNATIONAL LOGISTICS NETWORK

4.1 Overall Scheme

Based on the existing international logistics network infrastructure conditions of China and ASEAN, combined with the ASEAN development strategy, according to the above analysis of the logistics network impact ranking of ASEAN countries and the analysis of the logistics service quality level of each country, the ASEAN countries are divided into two groups. Singapore, Indonesia, Thailand, Malaysia and Vietnam are priority development considerations, and the Philippines, Myanmar, Cambodia, Laos and Brunei as supplementary development considerations.

It is suggested to give full play to comparative transport advantages in every country, so as to realize the international transportation between China and ASEAN in a larger scope and with more efficiency. As the construction of ports and railways is determined by planning, the linking role of international road transport should be fully played in the development of comprehensive transport, and the China ASEAN international logistics network should be built.

4.2 Specific Strategic Recommendations

1) Maritime transport

Among the countries with high comprehensive scores, Singapore, Malaysia and Indonesia are all far away from China and have obvious maritime transport advantages. Therefore, the development of international logistics in the above three countries should focus on the opening of key routes in the ocean. Actively connect with Kuala Lumpur Transport Strategic Plan (ASEAN Transport Strategic Plan 2016-2025) [5]. Currently, Indonesia, Malaysia, the Philippines and Thailand were exploring possible avenues to operationalize the 3 recommended priority routes, namely: Santos-Bitung route, Melaka-Dumai route, and Belawan-Phuket route. It is suggested to strengthen China's investment in infrastructure and other related projects at key ports to strengthen transportation between key ports.

2) International road transport

As China is adjacent to some ASEAN countries and has a relatively short transportation distance with neighboring countries, compared with other transportation modes, international road transportation can realize door-to-door, and has obvious advantages in transportation time and cost. The logistics service network of ASEAN countries adjacent to China shall be unblocked first, and the connectivity with ASEAN countries shall be promoted from near to far. Based on the above analysis, it is suggested to promote the construction of China ASEAN international road transport corridor by stages and steps.

(1) First, develop China-Vietnam international road transport corridor, and pass through Cambodia and Thailand to open the eastern Kunming/Nanning Hanoi-Danang-Nha Trang-Ho Chi Minh City-Phnom Penh-Bangkok.

(2) Continue to promote the construction of China-Thailand international road transport corridor, and strengthen the infrastructure construction in Laos, and extend it to Malaysia and Singapore, open the middle line to Mohan-Vientiane- Bangkok-Kuala Lumpur-Singapore international road transport route, and accelerate the construction of a transnational "southward" corridor with ASEAN Indochina Peninsula countries running through the north and south.

(3) Promote the construction of infrastructure in Myanmar and Cambodia, promote the construction of Ruili-Mandalay corridor, provide technical support for Ho Chi Minh Phnom Penh Bangkok line, and complement the weakness of infrastructure construction.

For out of gauge goods that need to be transported through the cold chain, such as goods, parts transportation and machinery transportation that cannot be disassembled, road transportation has unique advantages that other transportation methods cannot match, and it also conforms to the characteristics of trade development between China and ASEAN. In the development of China ASEAN international road transport, international road transport facilities should be provided for agricultural products, electronic equipment and other special trade materials between China and ASEAN.

3) Railway transportation

In terms of railway transportation, the Singapore Kunming Rail Link (SKRL) project is an integral part of the Trans Asian Railway, with three planning lines: the east line, the middle line and the west line. It was determined in 2006 and planned to be completed in 2036. Up to now, the China Laos line has been completed, and the Kunming Laos Vientiane section has been

opened, which is assisted by China. For other sections, due to different railway gauge, shortage of funds, and different interests of some countries, there is not much progress in other sections.

5 CONCLUSION

ASEAN is of great strategic significance to China in international trade, and international logistics is the basis of trade. This paper starts from the factors that affect China ASEAN international logistics, uses the principal component analysis method to analyze the different logistics situations in ASEAN countries, and combines the logistics service quality of ASEAN countries to draw strategic recommendations for the development of China ASEAN international logistics network. The main conclusions of this paper are:

(1) ASEAN countries are divided into two levels of linkage development, of which Singapore, Indonesia, Thailand, Malaysia and Vietnam are priority development countries, and other countries are complementary development countries. The purpose is to concentrate resource advantages and take advantage of the role of logistics.

(2) According to the division of countries and ASEAN development strategy, specific development suggestions are put forward for maritime transport, international road transport and railway transport. Most of the top countries are remote countries, which should actively support the development of maritime transport and increase the control of ports. According to the comprehensive ranking of ASEAN countries, put forward policy recommendations to promote the development of the international road. As the railway development is relatively stable, it is recommended to develop the combined transport of highway and railway.

REFERENCES

- [1] NGUYEN Thiyeen, Jin Zhang, Yan Yan, Ping Jian ASEAN Regional Logistics Nodes Analysis. CHINA TRANSPORTATION REVIEW, 2018,v.40(07):97-102.
- [2] Institute of International Trade and Economic Cooperation, Ministry of Commerce. 2021. Country (Region) Guide for Foreign Investment Cooperation: ASEAN. <http://fec.mofcom.gov.cn/article/gbdqzn/#>
- [3] The ASEAN Secretariat, ASEAN Economic Community Blueprint 2025, <https://asean.org/asean-economic-community-blueprint-2025/>
- [4] The World Bank , INTERNATIONAL LPI Global Rankings 2018, <https://lpi.worldbank.org/international/global/2018>
- [5] The ASEAN Secretariat, Kuala Lumpur Transport Strategic Plan (ASEAN Transport Strategic Plan) 2016-2025, <https://asean.org/book/kuala-lumpur-transport-strategic-plan-asean-transport-strategic-plan-2016-2025-2/>