

Assessment of Thai Check Point for Border Trade Operations

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Abstract— This paper proposes a method for evaluating the logistics network system. In-depth interview with experts and practitioners, site survey and information based on literature were used to carry out a preliminary investigation of logistics activities. Next, Analytic Hierarchy Process (AHP) was applied to rank alternative potential check points and analyze criteria weight of logistics network system. The main objective of the paper is to study a logistics network system of potential check points for border trade in Chiang Mai province and Mae Hong Son province for Thai-Myanmar cross-border trade. Sustainability played a significant role as the most important weight. It was found that Lak Tang is the best alternative.

Keywords— *check points; logistics network selection; analytic hierarchy process; Thailand; Myanmar*

I. INTRODUCTION

The ASEAN Leaders on the 30th Anniversary of ASEAN proposed the ASEAN Vision 2020 and agreed to be a union of Southeast Asian nations for looking outward, living in peace, stability and prosperity, bonded together in partnership in dynamic development and in a community of caring societies. Three pillars of the ASEAN Community are the ASEAN Political-Security Community, ASEAN Economic Community and ASEAN Socio-Cultural Community. Each pillar has its own Blueprint and together with the Initiative for ASEAN Integration (IAI) Strategic Framework and IAI Work Plan Phase II (2009-2015), they form the Roadmap for an ASEAN Community 2009-2015 [1].

The Thai government has proposed a number of project to face ample opportunities from this promising community. The more diminished barrier systems will allow at ease movement of goods, services, investment, capital and people. One of the Thai project is to economics connect with The Republic of the Union of Myanmar where has a vast potential for expanding industrial sectors. Moreover, this country has embarked on policy reforms and foreign investment laws for attracting foreign direct investment (FDI). Thailand is the second best FDI accumulation in The Republic of the Union of Myanmar such as energy sector, manufacturing industry sector, tourism and leisure sector and mining sector [2].

The crossing points for Thai-Myanmar cross-border trade has three types as permanent crossing point, temporary crossing point and check point for border trade. Thus, the Office of Strategy Management Upper Northern Provincial Cluster 1 has expected for developing potential check points for border trade in Chiang Mai province and Mae Hong Son province to be permanent crossing points. This research focused on Lak Tang, Chiang Mai province and Huay Ton Noon, Mae Hong Son province as a case study.

This research aims to study a logistics network system of potential check points for border trade in Chiang Mai province and Mae Hong Son province for Thai-Myanmar cross-border trade. The rest of this paper is structured as follows. Lak Tang and Huay Ton Noon are briefly described in section 2. Section 3 proposes a method to analyze logistics activities and assess logistics network system. Results of proposed methods are reported in Section 4. Finally, Section 5 provides conclusions.

II. BACKGROUND

Thailand and the Union of Myanmar share a management of border-related regulation issues by officials of the two governments. Normally, the Boundary Pillars (BP) are undertaken by the two Survey Departments on a regular basis for joint survey, maintenance, repair and reconstruction [3]. Chiang Mai province and Mae Hong Son province share the boundary with the Union of Myanmar as 227 and 483 kilometers, respectively.

A. Lak Tang check point for border trade

Lak Tang check point for border trade is located at Piang Luang sub-district, Wiang Haeng District, Chiang Mai province connects with a sector BP 3 (Shan state). This check point was officially announced to be the border trade since May, 1998.

However, Chiang Mai Governor has ordered to restrain the migration and commercial activities at this point because of national security reasons since April, 2002. Presently, the import and the export cross-border trade at BP 3 is disappear.

Lak Tang check point is an important strategic area of Chiang Mai province and should be considered to develop and support as the permanent crossing point for using the potential border trade zone. Thus, the Joint Government-Private Sectors Economic Committee voted on December, 2014 to assign the Upper Northern Regional Operation and Cooperation Centre studies an impact of Lak Tang check point in term of economics, security, environmental and community. A distance of Muang district and the check point is 177 kilometers within 3 hour's drive by using Highway No. 107 and Road No. 1322 as depicted in Fig. 1.

B. Huay Ton Noon check point for border trade

Mae Hong Son province is in the far Northwest of Thailand and has a potential border trade for supporting ASEAN activities as a West border gate of Thailand. Moreover, this gate can economically connect with India, Bangladesh, Pakistan and South China. These countries involve the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC).

Huay Ton Noon check point for border trade is located at Mae Ngao sub-district, Khun Yuam District, Mae Hong Son province connects with a sector BP 13 (Kayah state). This check point was officially announced to be the border trade since June, 1995. This check point is the first check point for border trade of Mae Hong Son province and daily operates from 6:00 am – 6:30 pm. Nevertheless, it was found that this check point has faced an import/export problem from a number of regulations of trade, forestry act, etc. Thus, this point cannot be upgraded to the permanent crossing point. Table I shows border trade volume from 2011-2014. A distance of Muang district and the check point is 115 kilometers as depicted in Fig. 2, but some parts of this route are muddy roads.

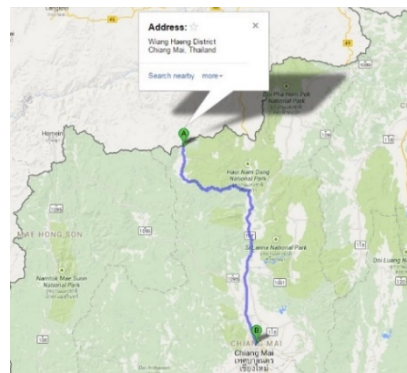


Fig. 1. A route to Lak Tang check point

TABLE I. HUAY TON NOON BORDER TRADE VOLUME (UNIT: MILLON BATH)

Type	Year			
	2011	2012	2013	2014
Import	5.77	0.52	2.36	9.25
Export	0.39	0.01	2.95	9.25
Total	6.16	0.53	5.31	18.50

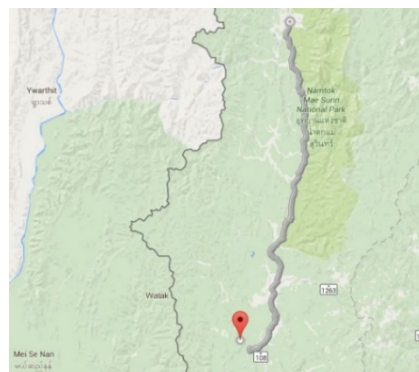


Fig. 2. A route to Huay Ton Noon check point

III. RESEARCH METHODOLOGY

In-depth interview with experts and practitioners, site survey and information based on literature were used to carry out a preliminary investigation of logistics activities. Analytic Hierarchy Process (AHP) is a systematic approach to give decision-making based on experience, intuition by using the structure of a well-defined methodology derived from sound mathematical principles. It not only states a formalized approach on economic justification of the time invested in the decision-making process, but also provides performance measurements for all alternatives according every criterion and alternatives sorting based on these performances. Thus, AHP was applied to rank alternative potential check points and analyze criteria weight of logistics network system.

A. Logistics Activities

A framework of logistics activities comprises of eight major activities and five minor activities. Eight major activities are customer service, order processing, demand forecasting, inventory management, transportation, warehousing and storage, reverse logistics and purchasing. Five minor activities are part and service support, plant and warehouse site selection, material handling, packaging and logistics communications. Lak Tang and Huay Ton Noon were analyzed by using this framework.

B. Analytical Hierarchy Process

AHP, which was developed by [4], has been widely used method to present complex decision problem for decision making process. For instance, it was applied to study influence factors of cross border trade facilitation among East-West Economic Corridor route [5]. It can apply to weight of data with qualitative and quantitative factors based on expert surveys [6]. Generally, the AHP method can be separated into four steps comprising of construction of hierarchical structure, creation of the pairwise comparison matrix, calculation of the priority alternative weights and consistency check [7-9].

Firstly, the elements, such as criteria and alternatives, are constructed a hierarchical structure by arranging for an interrelated hierarchy. The goal is the first of the hierarchical structure, while the in-between hierarchical structure is criteria. Also, alternatives are identified the final of the hierarchical structure.

Secondly, the pairwise comparison matrix is established for the relative of importance weights. The matrix A represents the pairwise comparison matrix. Let C_1, C_2, \dots, C_n indicate the set of criteria, while a_{ij} indicates the level of importance.

$$A = \begin{matrix} & & C_1 & C_2 & \dots & C_n \\ \begin{matrix} C_1 \\ C_2 \\ \vdots \\ \vdots \\ C_n \end{matrix} & \left| \begin{matrix} 1 & a_{12} & \dots & a_{1n} \\ 1/a_{12} & 1 & \dots & a_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ \vdots & \vdots & \vdots & \vdots \\ 1/a_{1n} & 1/a_{2n} & \dots & 1 \end{matrix} \right. \end{matrix}$$

The pairwise comparison is given values from 1 to 9 that are level of importance for weighting of two elements, as shown in Table II.

TABLE II. VALUES OF IMPORTANCE LEVEL FOR PAIRWISE COMPARISON

Relative importance (a_{ij})	Description (i over j)
1	Equal importance
3	Moderate importance
5	Strong importance
7	Very strong importance
9	Absolute importance
2,4,6,8	Intermediate values

Thirdly, the pairwise comparison matrix is calculated the priority weights of alternatives. The relative weights (W) or valued factors of matrix A is obtained from following equation:

$$AW = \lambda_{max}W \quad (1)$$

where λ_{max} = the biggest eigenvalue of matrix A

Finally, consistency check is to verify the pairwise comparison matrix for reliability. The consistency index (CI) is used to calculate by using the formula:

$$CI = (\lambda_{max} - n)/(n - 1) \quad (2)$$

where, λ_{max} indicates an approximation of the maximum eigenvalue.

Next, the consistency ratio (CR) is obtained by dividing the CI value by the Random Consistency index (RI) as given in Table III. The consistency ratio, the ratio of CI and RI, is given by:

$$CR = CI / RI \quad (3)$$

TABLE III. RANDOM CONSISTENCY INDEX VALUES (RI)

n	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.49

If the CR value is greater than 0.10 that means acceptable. The consistency check can be measured the consistency of decision makers for reliability and quality of outputs.

IV. RESULT

A. Thirteen Logistics Analysis

By using the logistics framework, it was found that Lak Tang does not perform any logistics activities but Huay Ton Noon has some logistics operations as shown in Table IV.

TABLE IV. LOGISTICS ANALYSIS FOR CHECK POINTS FOR BORDER TRADE

Major activity	Lak Tang	Huay Ton Noon
Customer service	No	Yes
Order processing	No	No
Demand forecasting	No	No
Inventory management	No	No
Transportation	No	Yes
Warehousing and Storage	No	Yes
Reverse logistics	No	No
Purchasing	No	Yes
Minor activity		
Part and Service support	No	No
Plant and Warehouse site selection	No	Yes
Material handling	No	No
Packaging	No	Yes
Logistics communications	No	No
Total	0	6

B. AHP

To assess logistics system development, the criteria are defined to reflect on connectivity of border trade with neighbor countries. There are four main criteria affecting logistics system that consists of infrastructure, institutional and legal framework, service provider and border trade [10]. However, these criteria are not realize long-term development. Then, sustainability, which was popularized in Our Common Future [11], is an important criteria to consider economics, environmental and social impacts. Hence five main criteria and fourteen items for logistics system evaluation are represented in Fig 3.

First, infrastructure realizes border location and highway network are assessed connectivity between Thailand's border and its neighbor countries [12]. In addition, land transport is an important logistics activity for border trade that links the trade, investment and service between Thailand and its neighbor countries [13].

Second, institutional and legal framework are related with agreement for bilateral transport, technical requirements for transport vehicles and forest law enforcement and wild animal reservation and protection act. These items concern agreement of each region.

Third, service provider is evaluated image and potential of them to response customer requirement for distribution efficiently. The image and potential of service provider provides service quality and operation costs affecting service provider selection.

Four, to promote border trade affecting growth economics development in different regions, there are assessed items such as export and import values, export and import products, workforce availability and special economic zones (SEZs). Border trade and investment impact on competitiveness and productivity of Thailand.

Finally, sustainability criteria can assess economic and environmental benefits and incorporate social responsibility into development of logistics system. The criteria of sustainability provide long-term development for logistics system. Next, these criteria will be applied to assess connectivity for development of logistics system.

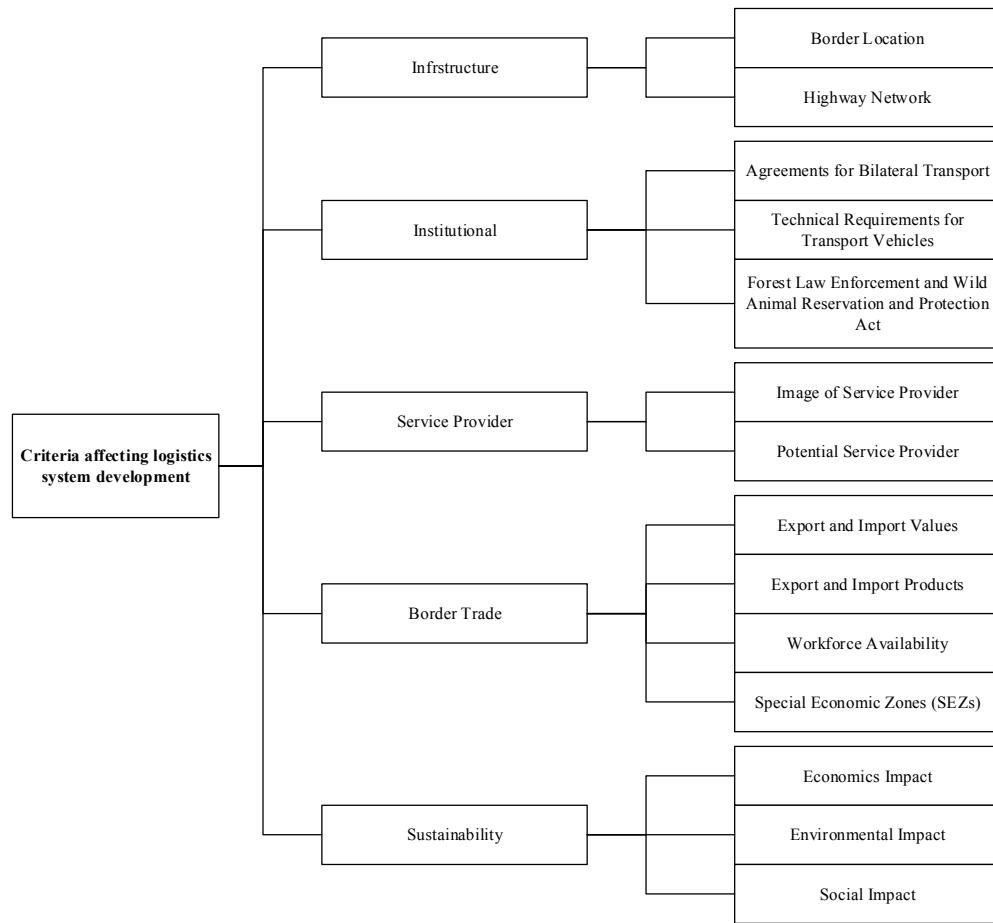


Fig. 3. Criteria of logistics system evaluation

Data collection was an important part of this research. Questionnaire is structured to collect perception data from knowledge people. Eighty seven filled questionnaires were screened to select only usable questionnaires. Thus, sixty three data were adopted for this research to evaluate logistics network systems by applying the proposed criteria. The pairwise comparison matrix of main criteria is shown and then calculated the priority weights of criteria in Table V and VI.

TABLE V. MAIN CRITERIA PAIRWISE COMPARISON MATRIX

Main Criteria	Infrastructure	Institutional and Legal Framework	Service Provider	Border Trade	Sustainability
Infrastructure	1	1/2	2	1/3	1/4
Institutional and Legal Framework	2	1	2	1/4	1/4
Service Provider	1/2	1/2	1	1/5	1/4
Border Trade	3	4	5	1	1/4
Sustainability	4	4	4	4	1
Total	10.500	10.000	14.000	5.783	2.000

TABLE VI. WEIGHT OF MAIN CRITERIA

Rank	Main Criteria	Weight
1	Sustainability	0.452
2	Border Trade	0.268
3	Institutional and Legal Framework	0.120
4	Infrastructure	0.094
5	Service Provider	0.066
Total		1.000
CR		0.083

Each sub-criterion was also compared on matrix and calculated weight as the main criteria. Sub-criteria comparison matrix and the priority weights of infrastructure, institutional and legal framework, service provider, border trade and sustainability are depicted from Table VII to Table XVI, respectively. It should be noted that it is not necessary to calculate CR for two criteria comparison.

TABLE VII. INFRASTRUCTURE PAIRWISE COMPARISON MATRIX

Infrastructure	Border Location	Highway Network
Border Location	1	1/4
Highway Network	4	1
Total	5.000	1.250

TABLE VIII. INSTITUTIONAL AND LEGAL FRAMEWORK PAIRWISE COMPARISON MATRIX

Institutional and Legal Framework	Agreements for Bilateral Transport	Technical Requirements for Transport Vehicles	Forest Law Enforcement and Wild Animal Reservation and Protection Act
Agreements for Bilateral Transport	1	3	2
Technical Requirements for Transport Vehicles	1/3	1	1/3
Forest Law Enforcement and Wild Animal Reservation and Protection Act	1/2	3	1
Total	1.833	7.000	3.333

TABLE IX. SERVICE PROVIDER PAIRWISE COMPARISON MATRIX

Service Provider	Image of Service Provider	Potential Service Provider
Image of Service Provider	1	1/6
Potential Service Provider	6	1
Total	7.000	1.167

TABLE X. BORDER TRADE PAIRWISE COMPARISON MATRIX

Border Trade	Export and Import Values	Export and Import Products	Workforce Availability	Special Economic Zones
Export and Import Values	1	1/3	1/3	1/4
Export and Import Products	3	1	1/2	1/4
Workforce Availability	3	2	1	1/4
Special Economic Zones	4	4	4	1
Total	11.000	7.333	5.833	1.750

TABLE XI. SUSTAINABILITY PAIRWISE COMPARISON MATRIX

Sustainability	Economics Impact	Environmental Impact	Social Impact
Economics Impact	1	1/4	1/4
Environmental Impact	4	1	1/2
Social Impact	4	2	1
Total	9.000	3.250	1.750

TABLE XII. WEIGHT OF INFRASTRUCTURE CRITERIA

Rank	Criteria	Weight
1	Highway Network	0.800
2	Border Location	0.200
Total		1.000

TABLE XIII. WEIGHT OF INSTITUTIONAL AND LEGAL FRAMEWORK CRITERIA

Rank	Criteria	Weight
1	Agreements for Bilateral Transport	0.525
2	Forest Law Enforcement and Wild Animal Reservation and Protection Act	0.334
3	Technical Requirements for Transport Vehicles	0.141
Total		1.000
CR		0.046

TABLE XIV. WEIGHT OF SERVICE PROVIDER CRITERIA

Rank	Criteria	Weight
1	Potential Service Provider	0.857
2	Image of Service Provider	0.143
Total		1.000

TABLE XV. WEIGHT OF BORDER TRADE CRITERIA

Rank	Criteria	Weight
1	Special Economic Zones	0.542
2	Workforce Availability	0.215
3	Export and Import Products	0.159
4	Export and Import Values	0.084
Total		1.000
CR		0.081

TABLE XVI. WEIGHT OF SUSTAINABILITY CRITERIA

Rank	Criteria	Weight
1	Social Impact	0.544
2	Environmental Impact	0.346
3	Economics Impact	0.110
Total		1.000
CR		0.046

Finally, alternative potential check points were compared with a selected permanent crossing point by applying AHP as shown an example of evaluating border location perspective in Table XVII and XVIII. The rest of criteria was displayed as the example. Hence, the best alternative was selected by multiplying weight and rated scored as shown in Table XIX. It was found that Lak Tang is the best alternative.

TABLE XVII. AN EXAMPLE OF ALTERNATIVE PAIRWISE COMPARISON MATRIX

Border Location	Standard	Huay Ton Noon	Lak Tang
Standard	1	1/2	1/2
Huay Ton Noon	2	1	1/2
Lak Tang	2	2	1
Total	5.000	3.500	2.000

TABLE XVIII. WEIGHT OF ALTERNATIVES IN BORDER LOCATION PERSPECTIVE

Rank	Alternative	Rated Scored
1	Lak Tang	0.490
2	Huay Ton Noon	0.312
3	Standard	0.198
Total		1.000
CR		0.046

TABLE XIX. WEIGHT OF ALTERNATIVES IN BORDER LOCATION PERSPECTIVE

Sub-Criteria	Weight	Standard		Huay Ton Noon		Lak Tang	
		Local Score	Global Score	Local Score	Global Score	Local Score	Global Score
Border Location	0.019	0.198	0.004	0.312	0.006	0.490	0.009
Highway Network	0.075	0.198	0.015	0.312	0.023	0.490	0.037
Agreements for Bilateral Transport	0.063	0.198	0.012	0.312	0.020	0.490	0.031
Technical Requirements for Transport Vehicles	0.017	0.198	0.003	0.312	0.005	0.490	0.008
Forest Law Enforcement and Wild Animal Reservation and Protection Act	0.040	0.198	0.008	0.312	0.013	0.490	0.020
Image of Service Provider	0.009	0.198	0.002	0.312	0.003	0.490	0.005
Potential Service Provider	0.056	0.198	0.011	0.312	0.018	0.490	0.028
Export and Import Values	0.023	0.198	0.004	0.312	0.007	0.490	0.011
Export and Import Products	0.043	0.198	0.008	0.312	0.013	0.490	0.021
Workforce Availability	0.058	0.198	0.011	0.312	0.018	0.490	0.028
Special Economic Zones	0.145	0.198	0.029	0.312	0.045	0.490	0.071
Economics Impact	0.050	0.198	0.010	0.312	0.016	0.490	0.024
Environmental Impact	0.156	0.198	0.031	0.312	0.049	0.490	0.077
Social Impact	0.246	0.198	0.049	0.312	0.077	0.490	0.120
Total			0.198		0.312		0.490

V. DISCUSSION AND CONCLUSIONS

This research proposed the method for evaluating the logistics network system. It was found that the most influence main criterion is sustainability. Hence, social impact and environmental impact were ranked as the influence sub-criteria of border trade operations. Lak Tang was selected as the best alternative, even though this check point does not have logistics activities. The decisions makers agreed that this area was a promising border trade for the future. This area is King Naresuan troop marched in force and has a natural attraction tourism. Huay Ton Noon performed better than the selected standard location. This area has been some logistics activities where could be an interesting ASEAN border trade location in the future. However, Huay Ton Noon should be developed to the permanent crossing point by focusing on sustainability dimension.

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