

# Logistics Development in the North–South Economic Corridor of the Greater Mekong Subregion

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## Abstract

Traders in the Greater Mekong Subregion require efficient logistics services that can move their goods to the right place, at the right time, in the right condition, and at the right price. It is, therefore, of great importance that regional links among neighboring countries are strengthened to facilitate trade and to develop logistics for better access to the global market. This is particularly true for the North–South Economic Corridor (NSEC), one branch of which extends from Kunming in the People’s Republic of China to Bangkok, Thailand. This branch, which is the focus of this paper, has three separate subcorridors.

A methodology to assess the NSEC macro-logistics system and subcorridors was developed and validated with empirical and secondary data for the three subcorridors in the Kunming–Bangkok branch of the NSEC. Infrastructure connectivity in the NSEC is almost complete, but border crossings are still the weakest link in the macro-logistics system. An integrated approach is needed in order to solve this key problem. This approach should combine solutions to physical infrastructure issues with adherence to rules and regulations. The remaining challenge is how to transform the NSEC subcorridors into fully fledged economic subcorridors that can attract investment and generate economic activities in remote areas of the subcorridors, such as border crossings.

## Introduction

The development of logistics services and communication technologies has revolutionized production and distribution processes, creating a global market. Shippers and consignees require efficient logistics services that can move their goods to the right place, at the right time, in the right condition, and at the right price. In the Greater Mekong Subregion (GMS),<sup>2</sup> it is, therefore,

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<sup>2</sup> The GMS comprises Cambodia, Lao People’s Democratic Republic, Myanmar, Thailand, and Viet Nam, as well as Yunnan Province and Guangxi Zhuang Autonomous Region of the People’s Republic of China.

of great importance that links among neighboring countries are strengthened to facilitate trade and to develop logistics for better access to the global market. This is particularly true for the North–South Economic Corridor (NSEC), one branch of which extends from Kunming in the People’s Republic of China to Bangkok, Thailand.

The NSEC has three subcorridors that link Kunming–Bangkok, Kunming–Ha Noi–Hai Phong, and Nanning–Ha Noi, respectively. The Kunming–Bangkok subcorridor travels through either the Lao People’s Democratic Republic (Lao PDR) and Myanmar or along the Mekong River. Thailand does not share a land border with the People’s Republic of China (PRC).

For some countries in the subregion, inadequate transport infrastructure and high logistics service costs have constrained economic corridor development and integration. Major infrastructure investments are already being undertaken by GMS countries, and more are planned, which will improve physical connectivity between neighboring countries. The improved infrastructure, coupled with expanded cross-border cooperation among GMS countries, will accelerate the process of integrating the subregion’s economic corridors into the rest of the world and the global market.

## **Logistics Development Policy**

Logistics is difficult to define because it is a constantly evolving concept. Logistics no longer concerns only the handling of materials or transport of materials; it has grown in scope to encompass the set of activities that facilitate the economic transactions associated with production and trade (Stock and Lambert 2001). These include customer service and support; demand forecasting and planning; facilities site selection, warehousing, and storage; inventory management; logistics communication and order processing; material handling and packaging; and reverse logistics, sourcing, and transport (Grant et al. 2006).

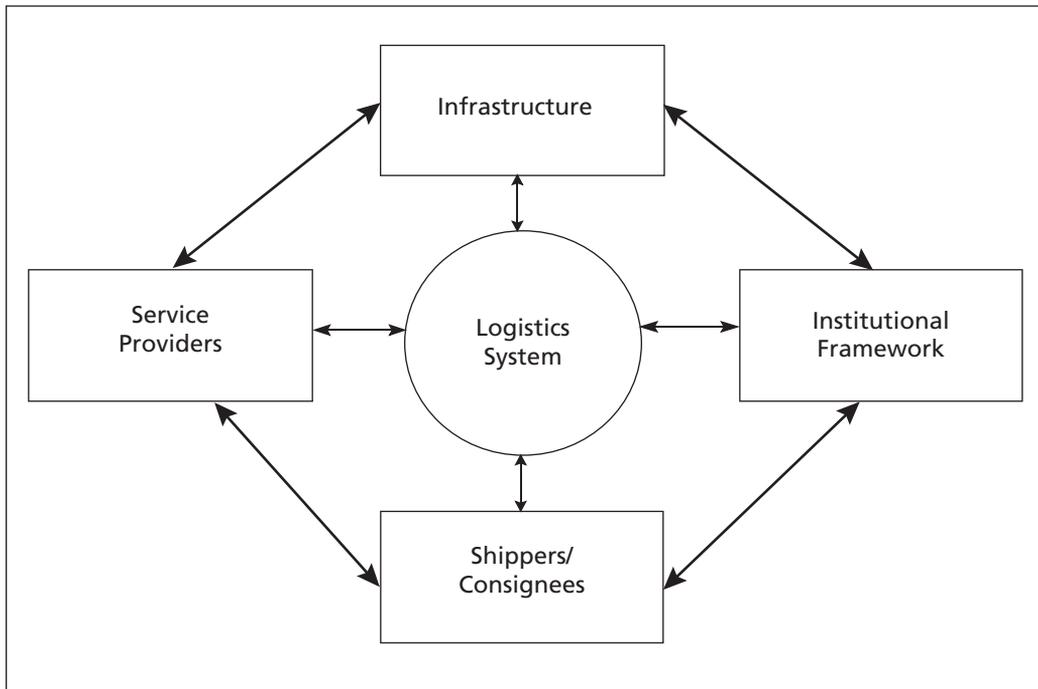
Logistics plays a key role in national and regional economies in two ways. First, it is one of the major expenditures for businesses, thereby affecting and being affected by other economic activities. Second, it supports the movement of a multitude of economic transactions; it is an important aspect of facilitating the sale of all goods and services.

Logistics is not just confined within national borders or markets, because within each country or region there are export and import firms that face specific logistics attributes that may be different from those experienced in the domestic market. In an international logistics system, many state agencies and—in particular—customs agencies play crucial roles in the efficiency of the logistics system. There is also heavy reliance on specialized service providers, such as freight forwarders or customs brokers, which can facilitate the flows of goods across borders. The biggest difference between domestic and international logistics is the environment in which the logistics system operates.

Logistics from a policy perspective is much more than just transport infrastructure development. A holistic approach that addresses the requirements of traders’ needs, service providers’ expertise, infrastructure capacity, and institutional framework is needed in order to develop national or regional logistics development policy.

A regional logistics system, like any other macro-logistics system, is composed of (i) shippers, traders, and consignees; (ii) public and private sector logistics service providers; (iii) provincial and national institutions, policies, and rules; and (iv) transport and communications infrastructure (Banomyong et al. 2007).

**Figure 1: Logistics System Components**



A useful working definition of logistics development policy is: a policy that involves the planning, facilitating, implementing, integrating and controlling the efficient, effective flow and storage of freight, people and information within and between logistics systems, for the purpose of enhancing traders' competitiveness in order to increase national and/or regional competitive advantage.

Figure 1 shows how these four components combine to determine the performance of each part of the logistics system in terms of cost efficiency, responsiveness, reliability, and security. These three performance indicators reflect both on the level of integration of the logistics system and logistics services capability within a system, such as the NSEC. The sum of these factors determines the competitiveness of the NSEC logistics system.

This paper describes the methodology used to assess the status quo of the NSEC macro-logistics system for the three subcorridors in the Kunming–Bangkok branch of the NSEC, as a prerequisite for setting up logistics development policies.

## **Economic Corridor Development**

The purpose of a transport corridor is to link areas physically that were not previously connected within a country or a region. A logistics corridor focuses not only on the physical connection but also on how the flow and storage of freight, people, and vehicles are optimized in the corridor with the support of capable service providers and a facilitating institutional environment provided by relevant agencies.

The main stakeholders involved are shippers and consignees using the various routes along the corridors, service providers offering different types of logistics services, and government agencies involved in the infrastructure as well as the rules and regulations on movement and storage of freight along the logistics corridor.

The potential strength of logistics corridors lies primarily in the possibilities that they offer in confronting the concerns and interests of all relevant stakeholders, public and private, who can focus on policies and initiatives to cater to specific routes and border crossings. They, thus, offer the possibility of tackling logistics issues in a holistic manner (institutional, administrative, and infrastructural), initiating and effecting changes that may otherwise be difficult to achieve at a wider national and/or regional level.

In an economic corridor, economic development will not be concentrated solely in large cities located along the corridor. Investment and economic development will need to reach smaller towns and rural areas along its route. Incentives to attract private sector investment need to be reviewed and harmonized between different countries along the economic corridor to facilitate economic activities in less-developed areas of the corridor. The success of an economic corridor will depend on the attraction of investment. Attraction of investment, in turn, relies on appropriate infrastructure and facilitation policies.

It is impossible to establish economic corridors at the outset. There is a gradual evolutionary phase that must be followed if their establishment is to be sustainable. The stages of development are shown in Table 1.

**Table 1: Corridor Development Level**

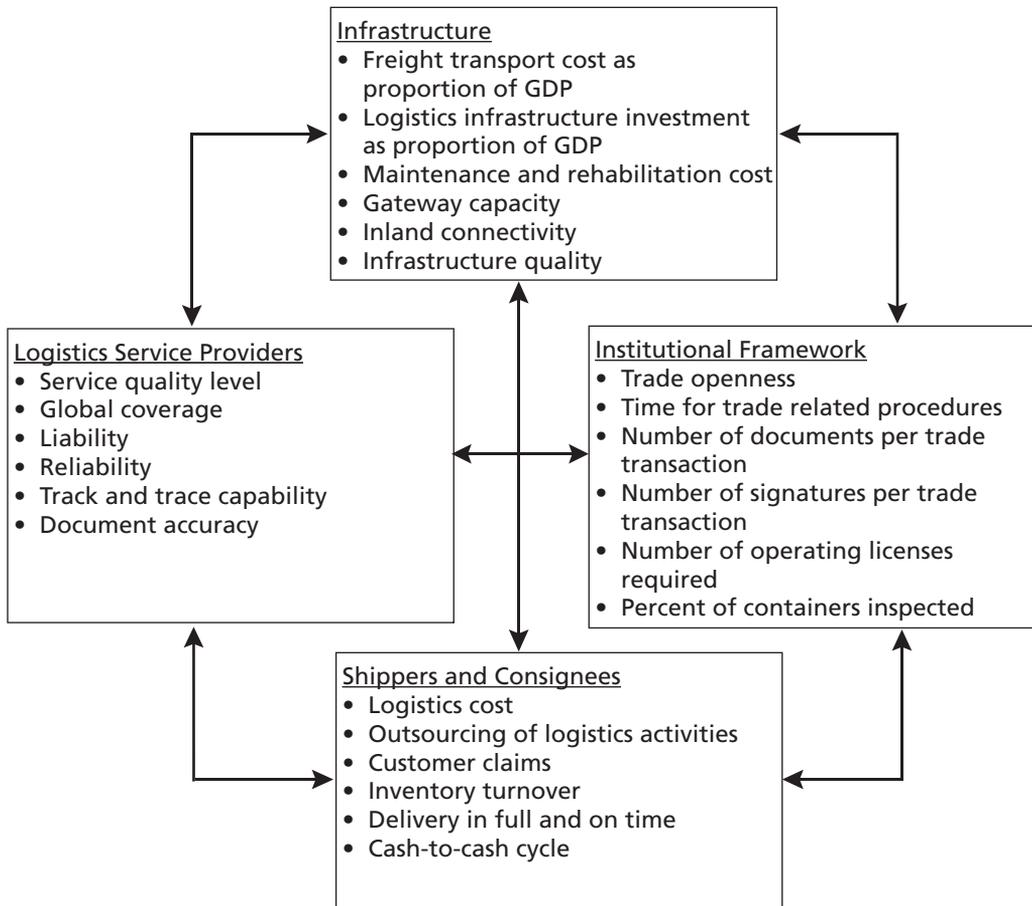
Stage	Corridor	Definition
Level 1	Transport corridor	Corridor that physically links an area or region
Level 2	Multimodal transport corridor	Corridor that physically links an area or region through the integration of various modes of transport
Level 3	Logistics corridor	Corridor that not only physically links an area or a region but also harmonizes the corridor institutional framework to facilitate the efficient movement and storage of freight, people, and related information
Level 4	Economic corridor	Corridor that is able to attract investment and generate economic activities along the less-developed area or region; physical links and logistics facilitation must first be in place

Source: Banomyong, R., P. Cook, and P. Kent. 2008. Formulating regional logistics development policy: the case of ASEAN. *International Journal of Logistics Research & Applications*, Vol. 11, No. 5, pp. 359–379.

## Methodology

In order to formulate adequate NSEC logistics development policies, a specific methodology was needed in order to describe the current logistics situation in the NSEC. The methodology used a scorecard (Figure 2) based on the four components of a logistics system—infrastructure, institutional framework, service providers, and traders—to evaluate the system’s capability as well as its strengths and weaknesses.

**Figure 2: Logistics Macro-Level Scorecard**



GDP = gross domestic product.

Not all proposed data for the scorecard could be gathered, and some proposed indicators were found to be inappropriate when trying to measure logistics components in the NSEC. This was particularly true for indicators related to shippers and consignees. New performance measures had to be selected to describe the overall macro-logistics capability of the countries in the NSEC. These are shown in the Findings section (see Figure 4). Therefore, a snapshot methodology was used in conjunction with the overall assessment to provide an indication of specific logistics system performance. This methodology used a detailed logistical activity map of specific products moving within the logistics corridor. A template for the data needed to draw the logistics cost and time map is shown in Table 2. This table is similar to a simplified process activity map.

Data collected for a particular product along a logistics corridor can then be graphically illustrated in a logistics corridor cost-and-time model, which helps describe the cost and time components of movement from origin to destination by each available route and mode as well as illustrate the delays at borders or other inspection points up to the destination within the corridor.

**Table 2: Template for Simplified Process Activity Map**

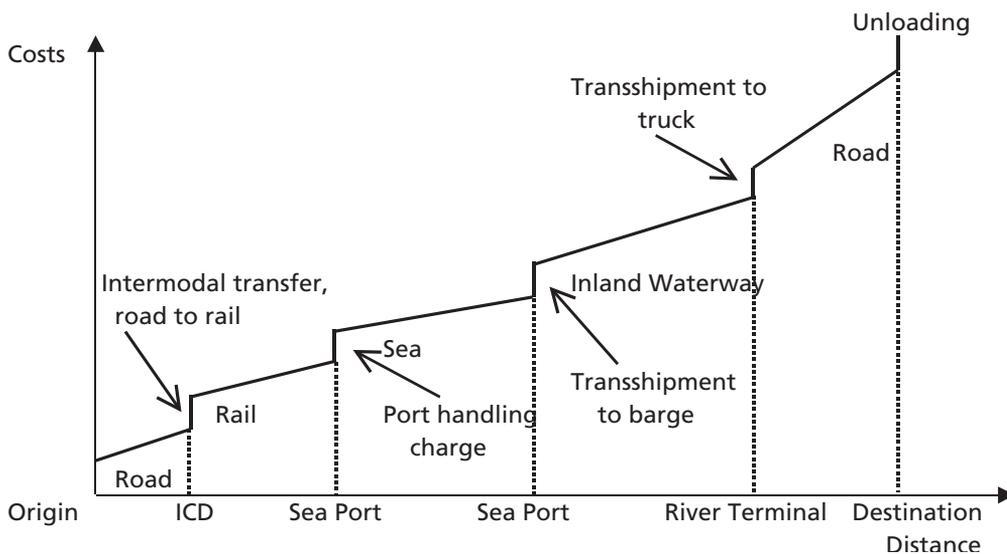
Activity Number	Average Time	Range of Time	Average Cost	Range of Cost	Actors	Documents/ Operations	Distance (cumulative)
1							
2							
3							

Source: Author.

The choice of transport mode(s) has a direct impact on the efficiency of logistics channels and systems. Depending on the mode chosen, the overall performance of the corridor will be affected (Liberatore and Miller 1995). Simple cost-distance models of road versus rail are commonly found (Fowkes et al. 1989, Marlow and Boerne 1992) for national movements, or sea versus air (Hayuth 1985, Jung and Beresford 1994) for longer, intercontinental routes. As the choice of logistics corridor is of vital importance to the success of a country’s international trade, various models have also been created (Beresford and Dubey 1990, Min 1991, Barnhart and Ratliff 1993, Yan et al. 1995, Beresford 1999) to help logistics decision makers choose the most effective logistics channel—one that not only minimizes cost and risk, but also satisfies various on-time service requirements.

The corridor cost model presented here includes both transport (e.g., road, rail, inland waterway, maritime) and intermodal transfer (e.g., ports, rail freight terminals, inland clearance depots) as cost components (Figure 3). This model has been adapted from one that was made by Beresford and Dubey (1990) and later improved by Beresford (1999).

**Figure 3: Corridor Cost Model**



ICD = inland clearance depot.

The model assumptions were based on the premise that unit costs of transport vary between modes, with the steepness of the cost curves reflecting the fact that, for volume movements, sea transport should be the cheapest per ton-kilometer, road transport should normally be the most expensive (at least over a certain distance), and waterway and rail costs should be intermediate. At ports and inland terminals, a freight handling charge is levied without any material progress being made along the supply chain; a vertical step in the cost curve represents the costs incurred there.

Similarly, by plotting time against distance, the relative speed of transit transport for each leg (or mode) can be compared, and the bottlenecks at transshipment points can be identified. As a rule, the higher the vertical step, the more likely that the border crossing or the nodal link is a bottleneck in the logistics corridor.

The corridor cost model used in this paper is subject to limitations with regard to reliability. The significance of reliability or uncertainty for a decision situation depends on the cost of reversing a commitment once made. When high uncertainty is coupled with high cost, uncertainty needs to be acknowledged and allowed for in the analysis.

Risk means both uncertainty and the results of uncertainty. That is, risk refers to a lack of predictability about structure, outcomes, or consequences in a decision or planning situation. In this case, how certain can the decision maker be that goods will arrive safely at a destination via a chosen logistics corridor? The term “perception of reliability” is used here to denote a method to develop a comprehensive understanding and awareness of the risks associated with the decision involved in the selection of logistics corridors (Vidal and Goetschalckx 2000).

The measurement of uncertainty for each mode of transport, intermodal transfer, border crossing, and other nodal activities uses a perception of reliability index based on a five point scale: 1 is perceived to be not reliable, 2 is perceived to be not very reliable, 3 is perceived to be fairly reliable, 4 is perceived to be reliable, and 5 is perceived to be very reliable. This index tries to capture some of the uncertainties involved in the selection of each logistics corridor. These ratings reflect the subjective values of the decision makers and related stakeholders.

The index was derived from the field of political science, especially political instability methodology. Qualitative predictive research in political instability focuses on intuition, judgment, and Delphi forecasting. Intuitive qualitative forecasting is central to a systematic analysis. All the persons interviewed for this study were knowledgeable about international trade transactions, transport operations, documentary procedures, and rules and regulations in their respective countries or region. The respondents “intuitively” assigned a rating for each factor based on their immersion in the history; culture; politics; and experience in trading practices, transport operations, and administrative procedures of their own country and—to a certain extent—of their own region.

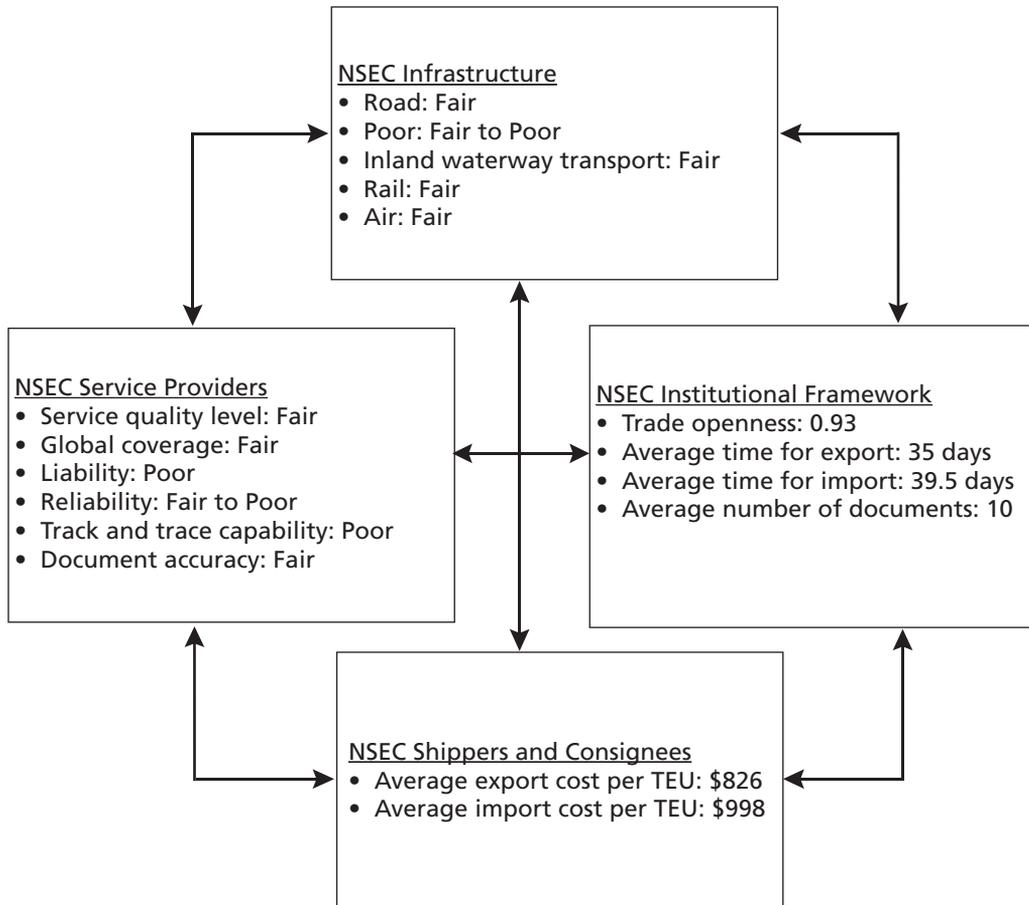
The perception of reliability indices for each logistics corridor were derived from unstructured interviews held with transport and logistics providers as well as shippers and consignees. During numerous interviews, the author asked groups of respondents to assign a rating for each mode of transport, border crossing, and nodal links along a particular corridor by consensus. This is why only integer numbers appear for each mode of transport or nodal link while fractions appear for the total confidence index. A route’s total perception of reliability index is calculated from the average of all the perception of reliability ratings on that particular route. It is acknowledged that there might be a problem with consensus ratings, because it was sometimes difficult for respondents with divergent views to express them openly.

# Findings

## Logistics Scorecard and Corridor Assessment Level

The indicators used to develop a macro-logistics scorecard and their respective values for the NSEC are shown in Figure 4.

**Figure 4: North–South Economic Corridor Macro-Logistics Scorecard**



NSEC = North–South Economic Corridor, TEU = twenty equivalent unit (i.e., a 20-foot container)

Source: Compiled from industry and secondary data.

An assessment of the Kunming–Bangkok subcorridor of the NSEC (Table 3) shows that there are currently no level 4 or established economic subcorridors yet in place. An overall assessment level for the various subroutes in the Kunming–Bangkok corridor was limited to the weakest link, level 1, which means that there are currently only transport subcorridors in place.

**Table 3: Level Assessment of North–South Economic Corridor Route No. 3, Bangkok–Kunming**

<b>From</b>	<b>To</b>	<b>Level</b>
Bangkok	Chiang Rai	3
Chiang Rai	Mae Sai	3
Chiang Rai	Chiang Saen	3
Chiang Rai	Chiang Khong	3
Mae Sai/Tachileik	Mongla/Daluo	1
Daluo	Kunming	3
Chiang Saen	Jinghong	2
Jinghong	Kunming	3
Chiang Khong/Hoeuy Xay	Bo Ten/Bo Harn	1
Bo Harn	Kunming	3
<b>Overall Level</b>		<b>1</b>

Source: Compiled from industry data.

### **Bangkok–Kunming Expressway (Route No. 3)**

The Kunming–Bangkok subcorridor is expected to become important infrastructure in the subregion. It will function as a land bridge between southern PRC and other GMS countries, particularly Thailand. Once the subcorridor is fully operational, significant impacts can be anticipated, such as shifts in transport mode and short- and long-term economic and sociological changes.

For the Kunming–Bangkok subcorridor, three routes currently connect the cities:

- Route No. 3 West (R3W): Bangkok–Chiang Rai–Mae Sai–Keng Tung–Mong La–Menghi–Yunjinghong–Kunming,
- Bangkok–Chiang Rai–Chiang Saen–Mekong River–Yunjinghong/Kuanlei–Kunming, and
- Route No. 3 East (R3E): Bangkok–Chiang Rai–Chiang Khong–Hoeuy Xay–Luang Namtha–Bo Ten–Bo Harn–Kunming.

The characteristics of the Kunming–Bangkok subcorridor are summarized in Table 4. The distances of these three routes are not significantly different. At present, the route via the Mekong River is the most popular; the R3W route is never used for “official” transit purposes due to the political situation and the transit fee in Myanmar.

Figures 5 and 6 describe graphically how cost and time increase along the three logistics subcorridors of the Kunming–Bangkok route based on 2006 data. The route via the Mekong

**Table 4: Characteristics of Kunming–Bangkok Routes**

Logistics Infrastructure		Route Choice (distance in kilometers)		
		via Myanmar (R3W)	via Mekong River	via Lao PDR (R3E)
Bangkok– Chiang Rai	Four-lane highway	830	830	830
Chiang Rai–Mae Sai	Four-lane highway	60		
Chiang Rai–Chiang Saen	Two-lane highway		60	
Chiang Rai–Chiang Khong	Two-lane highway			110
R3W	Two-lane highway	253		
Mekong River	Mekong River ports		360	
R3E	Two-lane highway			228
R3W/R3: Daluo to Kunming	Six-, four-, and two-lane highway	674		
R3: Yunjinghong to Kunming	Six- and two-lane highway		534	
R3E/R3: Bo Ten/Bo Han to Kunming	Six-, four-, and two-lane highway			688
<b>Total Length</b>		<b>1,817</b>	<b>1,784</b>	<b>1,856</b>

Lao PDR = Lao People’s Democratic Republic, R3 = Route No. 3, R3E = Route No. 3 East, R3W = Route No. 3 West.

Note: Approximate distances after all projects are completed.

Source: Author.

River has the lowest total cost but takes the longest time. The route via Myanmar has the highest uncertainty from a user’s perspective.

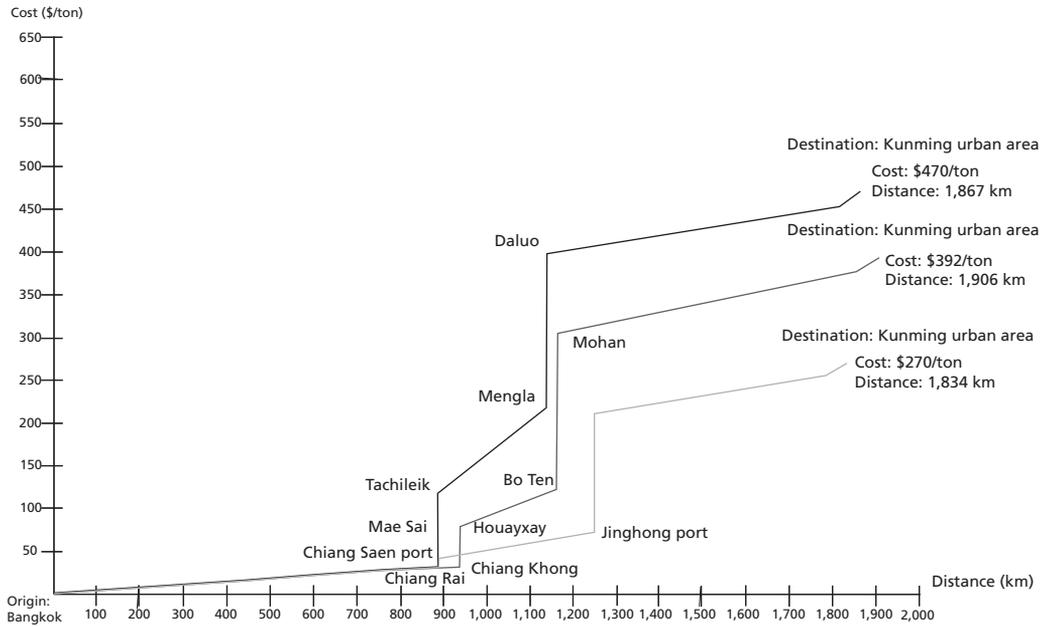
Border crossings seem to be where there is the highest cost and time increase without any movement of goods. This clearly shows that actual transport in itself is not a major impediment, but effectiveness and efficiency very much depend on how costly and how quickly borders can be crossed. The full implementation of the GMS Cross Border Transport Agreement (CBTA)<sup>3</sup> would play a crucial role in the reduction of border crossing cost and time.

Tables 5 and 6 provide more details on border crossing charges as a proportion of total transit and border crossing costs in 2006. The pure transport cost on all three routes is less than the border crossing and transit charges. This shows that transport, even though a critical component of the subcorridor cost, is not the biggest factor.

Tables 7 and 8 show the proportion of total transport and border crossing time. Transport takes more than 80% of total subcorridor time, but when the infrastructure is completed, this will probably be reduced.

<sup>3</sup> The CBTA is a regional transport and transit agreement that is supposed to facilitate the movement of people, freight, and vehicles within the GMS. One of the CBTA’s main contributions is the requirement for single-stop inspections at border crossings. Single-stop inspections will reduce costs and time during border crossings.

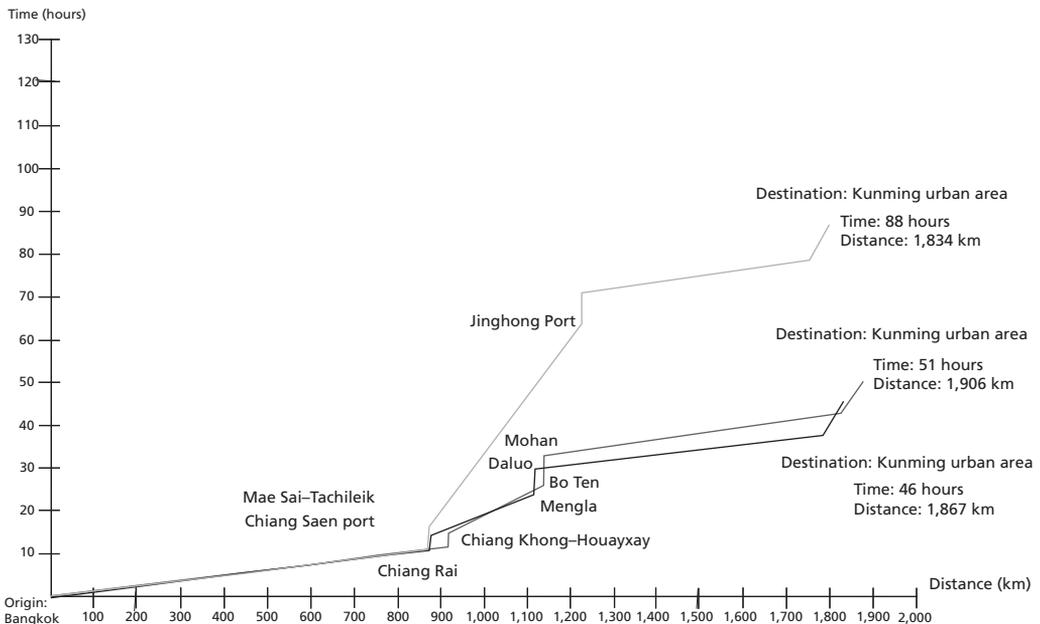
**Figure 5: Cost Model of Route No. 3 from Bangkok to Kunming, 2006**



km = kilometers.

Source: Compiled from industry data.

**Figure 6: Time Model of Route No. 3 from Bangkok to Kunming, 2006**



km = kilometers.

Source: Compiled from industry data.

**Table 5: Route No. 3 Cost Summary, 2006**

<b>Route</b>	<b>Transport and Distribution (%)</b>	<b>Border Crossing and Transit Fees (%)</b>
R3W	42	58
R3E	40	60
Via Mekong River	(Road) 32 (River) 15	53

R3E = Route No. 3 East, R3W = Route No. 3 West.

Source: Author.

**Table 6: Route No. 3 Border Cost Summary, 2006**

<b>Route</b>	<b>Border 1, Thailand (%)</b>	<b>Border 2, Lao PDR and Myanmar (%)</b>	<b>Border 3, Lao PDR and Myanmar (%)</b>	<b>Border 4, PRC (%)</b>	<b>Total Border Cost (%)</b>
R3W	Mae Sai, 1	Tachileik, 33	Monglar, 15	Daluo, 51	100 (\$271.00 per ton)
R3E	Chiang Khong, 2	Hoeuy Xay, 20	Bo Ten, 18	Bo Harn, 60	100 (\$232.00 per ton)
Via Mekong River	Chiang Saen, 3	NA	NA	Zinghong, 97	100 (\$141.50 per ton)

Lao PDR = Lao People's Democratic republic, NA = not applicable, PRC = People's Republic of China, R3E = Route No. 3 East, R3W = Route No. 3 West.

Source: Author.

**Table 7: Route No. 3 Time Summary, 2006**

<b>Route</b>	<b>Transport and Distribution Time (%)</b>	<b>Border Crossing Time (%)</b>
R3W	80	20
R3E	85	15
Via Mekong River	(Road) 32 (River) 54	14

R3E = Route No. 3 East, R3W = Route No. 3 West.

Source: Author.

**Table 8: Route No. 3 Border Time Summary, 2006**

Route	Border 1, Thailand (%)	Border 2, Lao PDR and Myanmar (%)	Border 3, Lao PDR and Myanmar (%)	Border 4, PRC (%)	Total Time Spent at Borders (%)
R3W	Mae Sai, 12.0	Tachileik, 22.0	Monglar, 22	Daluo, 44	100 (9 hours)
R3E	Chiang Khong, 12.5	Hoeuy Xay, 12.5	Bo Ten, 25	Bo Harn, 50	100 (8 hours)
Via Mekong River	Chiang Saen, 46.0	NA	NA	Zinghong, 54	100 (13 hours)

Lao PDR = Lao People's Democratic Republic, NA = not applicable, PRC = People's Republic of China, R3E = Route No. 3 East, R3W = Route No. 3 West.

Source: Author.

**Table 9: North–South Economic Corridor Cost, Time, and Perception of Reliability Summary, 2006**

Routing	Cost/Ton (\$)	Time (hours)	Distance (kilometers)	Perception of Reliability <sup>a</sup> (score out of 5)
R3W via Myanmar	470	45	1,867	3.0
R3E via Lao PDR	392	51	1,906	3.2
R3 via Mekong River	271	112	1,834	3.4
Hai Phong–Kunming	87	58	885	2.7
Nanning–Ha Noi	27	19	440	3.0

Lao PDR = Lao People's Democratic Republic, R3E = Route No. 3 East, R3W = Route No. 3 West.

<sup>a</sup> Reliability scale: 1 = perceived to be not reliable, 2 = perceived to be not very reliable, 3 = perceived to be fairly reliable, 4 = perceived to be reliable, and 5 = perceived to be very reliable.

Table 9 provides a summary of the cost, time, and perception of reliability status on the NSEC for 2006. Perceptions of reliability by stakeholders fall short of *reliable* in all routes examined.

## Discussion

By 2015, the physical and institutional infrastructure are expected to be in place. The projected numbers above are based on that assumption; border time and costs are within the scope of the intended output of the CBTA arrangements. Freight charges may increase or decrease, but the key logistics bottlenecks—the border crossings—still need to be addressed. Time is

of the essence, because infrastructure development is moving much quicker than institutional arrangements between countries.

The lack of standardized and harmonized border and transit trade procedures is the weakest link in the NSEC subcorridors, and special attention must be given to border issues. This lack, together with weak infrastructure links, is currently hindering the development of a macro-logistics system that can satisfy customers while controlling or even lowering all the total costs involved. The infrastructure links are the backbone of logistics development in the NSEC, and upgrading the infrastructure must occur in conjunction with the facilitation of trade, transit, and transport services to create an effective and efficient integrated logistics system in the NSEC.

Transit trade is currently minimal compared to border trade, but transit can become an important component of trade along the NSEC (Than 2005). However, border trade must not be forgotten, and border facilities to support the expansion of border trade are needed.

An integrated approach is needed in order to solve these problems. Such an approach should combine solutions to the physical or “hardware” infrastructure aspect with solutions to the “software” rules and regulation aspect. Most problems involved in the development of logistics systems for cross-border and transit trade are related to the import, export, and transit processes of GMS countries. Infrastructure is considered a constraint, but the impact may not seem important due to the relatively low volumes involved as well as a commitment by member countries to link the subcorridors physically and institutionally by 2015.

The perception of reliability index and ratings is only accurate as long as the national and regional environment does not change. It is very important to assess and monitor the situation along the NSEC continually. Turmoil in a country, changes in national or regional policies, or infrastructure upgrading can have a significant impact on the selection of a particular logistics corridor. If changes occur, there will be a need to reevaluate which logistics corridor is the most effective and efficient under the new circumstances.

The challenge remains on how to transform these future logistics corridors into fully fledged economic corridors that can attract investment and generate economic activities in remote areas of the corridors, such as at border crossings.

## **Acknowledgments**

This paper is based on an unpublished report, Logistics Development Study of the North–South Economic Corridor. The study was conducted with assistance from national consultants, Chuntao Zhang (the People’s Republic of China), Viraxay Phonekeo (the Lao People’s Democratic Republic), Apichat Sopadang (Thailand), and Trinh Thi Thu Huong (Viet Nam).

Ronald Antonio Q. Butiong, senior regional cooperation specialist and task manager for the Asian Development Bank’s (ADB) Development Study of the North–South Economic Corridor, provided overall guidance and support. Charisse Tubianosa, consultant for the Bank’s Development Study of the North–South Economic Corridor, also provided assistance for various activities related to the conduct of this study.

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