CHAPTER 8

Possible Alternative Routes for Further Connectivity in the Mekong Region

Ikumo Isono

This chapter should be cited as:

ISONO, Ikumo , 2011. “Possible Alternative Routes for Further Connectivity in the Mekong Region.” In *Intra- and Inter-City Connectivity in the Mekong Region*, edited by Masami Ishida, BRC Research Report No.6, Bangkok Research Center, IDE-JETRO, Bangkok, Thailand.

CHAPTER 8

POSSIBLE ALTERNATIVE ROUTES FOR FURTHER CONNECTIVITY IN THE MEKONG REGION

Ikumo Isono[1]

INTRODUCTION

Connectivity between clusters is becoming more important. The incentive of manufacturing firms to connect to regions comes from the existence of a huge gap in wages and potential new markets. The incentive of the governments is boosting up economic growth and then creating wealth. Improvement of connectivity, especially in terms of roads and other logistic infrastructures, will benefit the people.

However, many regions except those with valuable natural resources still have lower incomes even though we have already experienced great advance in the improvement of physical and soft infrastructure. Moreover, there is a fear that the improvement of specific roads may lead to a further widening of the gap between people connected directly by roads and those far from roads.

The introduction of alternative routes is thought of as a solution for tightening the connectivity as well as narrowing the economic gap. For firms, it is beneficial if there are several alternative routes, because they can avoid natural disasters such as floods in specific points or congestion caused by accidents. For people, the existence of various

[1] ikumo_isono@ide-jetro.org.

ways gives the opportunity to participate in the expanding production network in this region. This chapter first sets the main routes and alternative routes based on the current economic activities, and then identifies the possibilities of competition and coordination between the main and several alternative routes.

The relationship between the main and the alternative routes is highly relevant to the concept of economic corridors in the Greater Mekong Subregion (GMS) program by the Asian Development Bank (ADB), because these corridors are prioritized by the ADB, other international bodies and the governments. We mostly consider the main routes as the economic corridors in the GMS program. The GMS program was started in 1992 among six countries and now has nine high-priority subregional projects in transport, energy, telecommunications, the environment, human resources development, tourism, trade, private sector investment, and agriculture. The concept of economic corridors was introduced in 1998 at the eighth ministerial meeting and the prototype of the three economic corridors, namely the East-West Economic Corridor (EWEC), the North-South Economic Corridor (NSEC), and the Southern Economic Corridor (SEC), was introduced in 2000. The objective of economic corridors is to accelerate economic growth by connecting remote regions and industries via roads and other infrastructures. The three economic corridors were set as the three flagship projects out of 11 GMS flagship projects as follows:

1. NSEC
2. EWEC
3. SEC
4. Telecommunications Backbone and Information and Communications Technology

5. Regional Power Interconnection and Power Trade Agreements
6. Facilitating Cross-Border Trade and Investment
7. Enhancing Private Sector Participation and Competitiveness
8. Developing Human Resources and Skills Competencies
9. Strategic Environment Framework
10. Flood Control and Water Resource Management
11. GMS Tourism Development[2]

The economic corridor approach is still alive in the Master Plan on ASEAN Connectivity, developed by the ASEAN Secretariat in cooperation with the ADB, Economic Research Institute for ASEAN and East Asia (ERIA), United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), and the World Bank, and adopted in 2010 at the 17th ASEAN Summit. The Master Plan categorizes key strategies into physical and institutional connectivity, and gives highest priority to the highway network improvement out of seven strategies of the physical connectivity.

1. Complete the ASEAN Highway Network
2. Complete implementation of the Singapore Kunming Rail Link (SKRL) project
3. Establish an efficient and integrated inland waterways network
4. Accomplish an integrated, efficient and competitive maritime transport system
5. Establish integrated and seamless multimodal transport systems to make ASEAN the transport hub in the East Asia region

[2] Ten flagship projects excluding GMS Tourism Development were assigned in 2001 at the 10th ministerial meeting, and GMS Tourism Development was added in 2002 (Ishida and Kudo 2007).

6. Accelerate the development of ICT infrastructure and services in each of the ASEAN member states
7. Prioritize the processes to resolve institutional issues in ASEAN energy infrastructure projects

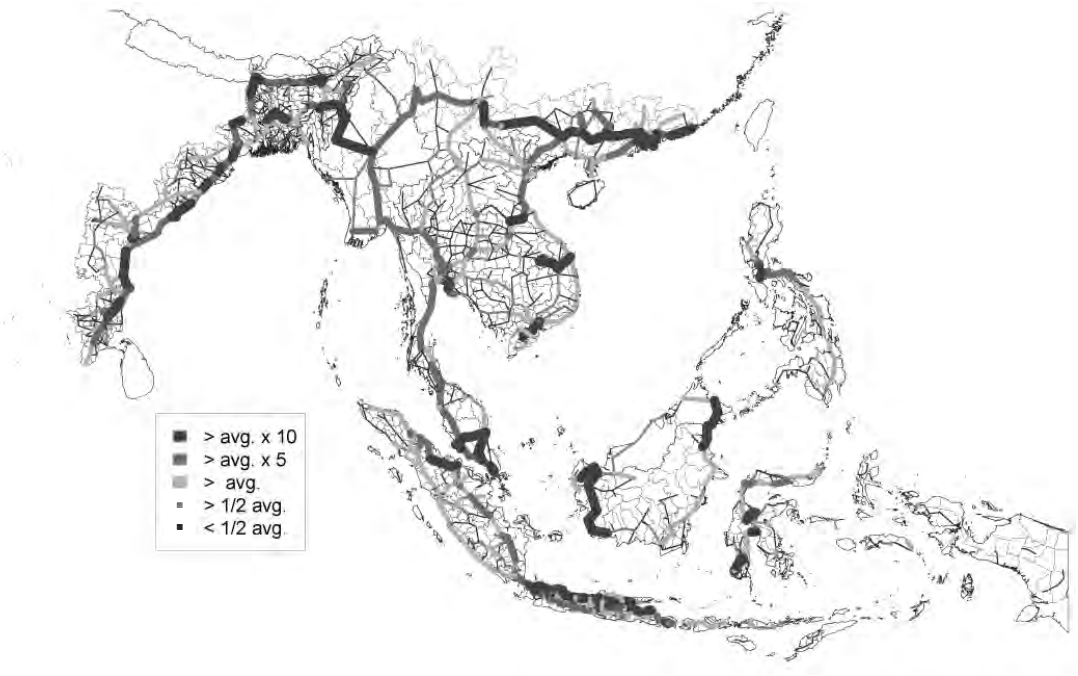
The main routes in this chapter are in some places different from the economic corridors. This is because the aim of the economic corridors is both enhancement of competitiveness and poverty alleviation in the region, so they are not the same as the main routes through which the goods are mostly shipped. We can provide the EWEC case as an example. The EWEC runs from Da Nang in Vietnam to the Lao Bao/Dansavan border, Savannakhet in Laos, the Second International Mekong Bridge crossing the Savannakhet/Mukdahan border, Khon Kaen in Thailand, the Mae Sot/Myawadi border, and Mawamyine in Myanmar. Although EWEC development has been prioritized and Thailand is now expanding a whole section of the EWEC in Thailand from two lanes to four lanes, the main logistic routes are between Bangkok and Yangon via the Mae Sot/Myawadi border, and between Bangkok and Hanoi via the Savannakhet/Mukdahan border. In the EWEC, only the routes between Tak in Thailand and Hpa An in Myanmar and between Kuchinarai in Thailand and Dong Ha in Vietnam have large transport demand. The other sections are relatively not so utilized.

To identify the actual or potential shipment demand, we use the IDE/ERIA Geographical Simulation Model (IDE/ERIA-GSM[3]) developed by IDE-JETRO and ERIA. The IDE/ERIA-GSM is a simulation model based on the spatial economic model with multiregion settings (Krugman 1991 and 1993; Fujita, Krugman and

[3] All simulation results of IDE/ERIA-GSM in this chapter are provided by the IDE-JETRO GSM team.

Venables 1999; Fujita, Krugman and Mori 1999; Behrens *et al*. 2004 and 2009; Kumagai *et al*. 2008 and 2009; and Kumagai *et al.* 2010). The model estimates the economic impacts of several infrastructure development projects such as the EWEC and the SEC. We compare the baseline scenario where there are no new infrastructure projects and development scenarios, derive the differences and call the differences economic impacts. Figure 1 depicts an expected surface traffic derived by the IDE/ERIA-GSM in 2005. We can see there are the routes with high transport demand and the others. In Thailand, all the routes with high transport demand radiate from Bangkok.

Figure 1: Expected Land Traffic (2005)



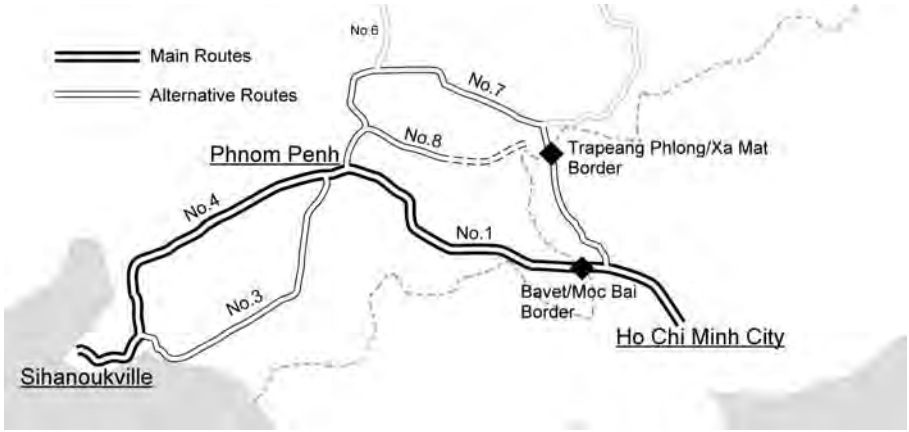
Source: Kumagai *et al.* (2010) based on the IDE/ERIA-GSM 3.

Ishida and Kudo (2007) presented two issues regarding GMS development. The first issue was that trade between Thailand and Vietnam was largely done by sea transport. At that time, only a slight trend was seen in the land transport between the two countries. However, nowadays land transport is considered a useful alternative route faster than sea transport and cheaper than air transport. JETRO's survey in the Mekong region in 2009 found that electronics companies in Hanoi want to purchase parts and components from factories in Bangkok's and Ayutthaya's electronics clusters. Furthermore, some firms had started to use the surface route as a main regular route.

The second issue by Ishida and Kudo (2007) is the concern that as cars only went through the Laos and Cambodia sections, there might be only a small positive impact on the two countries. Ishida and Kudo (2007) itself and Ishida (2010) clearly answered that the solution is the development of border economies. This chapter also discusses the possibility of border economies and the possibility of competition among border economies.

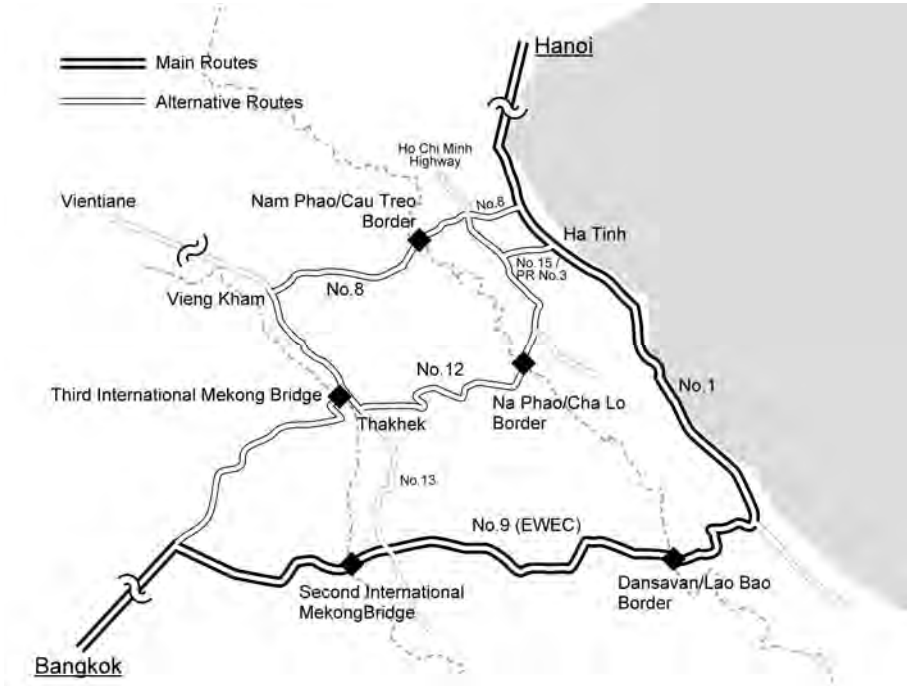
We discuss two case studies on possible alternative routes, compared with the main routes. The first case study is along and near the SEC as in Figure 2 and the second one is between Bangkok and Hanoi as in Figure 3, considering that the route via the EWEC is the main one. In the former case, national roads No. 4 and No. 3 in Cambodia between Phnom Penh and Sihanoukville, and routes between Phnom Penh and Ho Chi Minh City are compared. In the latter case, a route via the EWEC, No. 12+Ha Tinh, No. 12+No. 8 and No. 8 are discussed. The latter case is important because the Third International Mekong Bridge is under construction between Nakhon Phanom in Thailand and Thakhek in Laos. When the Third Bridge is completed, the

Figure 2: Alternative Routes Related to the Southern Economic Corridor



Source: Author.

Figure 3: Alternative Routes Related to the East-West Economic Corridor



Source: Author.

road distance from Bangkok to Hanoi will be shortened substantially (Kawada 2009). It may encourage firms to change the route from the EWEC to the Third Bridge when they ship between Bangkok and Hanoi.

Moreover, as seen in Figure 1, the results of the IDE/ERIA-GSM show that even now the distance between Bangkok and Hanoi via the Second International Mekong Bridge and Thakhek is shorter than the current EWEC route via the Second International Mekong Bridge and Dong Ha. Although the IDE/ERIA-GSM leaves much room for improvement on the data as well as the model, it provides information about the potential of the Third International Mekong Bridge. In addition, the fact that firms, especially Japanese multinational firms, do not utilize the Thakhek route implies the existence of obstacles in the route via Thakhek or some advantage of the EWEC in terms of soft infrastructure.

Based on the case studies, we conclude four patterns of alternative routes. The first pattern is an alternative route to avoid flooding or accidents in the main road. National road No. 3 in Cambodia applies. The second pattern is an alternative route serving transport demand for other cities and regions. In this sense, it is not an alternative route between the two cities. National road No. 7 in Cambodia is a case. The third one is an alternative route having the possibility to overcome the main route temporarily. Because national road No. 1 in Cambodia has a missing link for crossing the Mekong River at Neak Leung, national road No. 8 now under construction has an opportunity to replace No. 1 until the Neak Leung Bridge is completed. The fourth pattern is an alternative route having high possibility to compete with the main route. We discuss national roads No. 12 and No. 8 in Laos and Vietnam for the case.

This paper is organized as follows: the next section explains briefly about the

GSM transport costs and their implications, Section 2 discusses possible alternative routes related to the SEC and the EWEC, and Section 3 states the conclusions and the policy implications.

1. GSM TRANSPORT COSTS AND THEIR IMPLICATIONS

1.1. GSM Transport Costs

Transport costs are one of the most important factors in the IDE/ERIA-GSM. Even though we do not have enough detailed data on roads and other logistic infrastructures, the analysis by the IDE/ERIA-GSM tells us which route has the largest potential in terms of transport demand. We follow the two steps to get the transport costs within the model, namely, the GSM transport costs.

First, we estimate the behavior of the firms using a multinomial logit model, utilizing the results of a survey done by the ERIA innovation and agglomeration project (Table 1). It shows the tendency of the firms as follows:

1. Firms tend to use trucks for domestic suppliers/customers.
2. For longer distances in shipping products from/to partners, firms are more likely to use sea and air transport.
3. Firms in the machinery industry tend to use air transport for foreign partners unless there is a smooth border transaction between the two countries.

Table 1: Results of a Multinomial Logit Model

Truck as a basis	Air			Sea		
	Coef.		S.D.	Coef.		S.D.
Abroad	3.573	***	0.736	2.915	***	0.428
ln Distance (Food as a basis)	0.444	***	0.170	1.268	***	0.167
*Textiles	0.104		0.126	-0.151		0.094
*Machineries	0.300	**	0.135	0.112		0.086
*Automobile	0.201		0.174	-0.104		0.154
*Others	0.148		0.106	-0.068		0.066
Constant	-5.711	***	0.760	-9.621	***	0.993
Country dummy: Indonesia as a basis						
Philippines	-0.336		0.470	0.364		0.446
Thailand	-2.239	**	0.904	-0.794		0.624
Vietnam	-2.483	***	0.683	-0.437		0.419
Statistics						
Observations	1,312					
Pseudo R-squared	0.3407					
Log likelihood	-321.5					

Source: Kumagai *et al.* (2010) based on the IDE/ERIA-GSM 3.

Second, we set the following two assumptions to define the behaviors of firms within the model.

1. Firms in the machinery industry will make a choice between truck and air transport by comparing higher probability obtained by the multinomial logit estimation.
2. Firms in the other sectors will make a choice between truck and sea transport by comparing higher probability obtained by the multinomial logit estimation.

Then, we construct a simple linear transport function which consists of distance,

speed, transaction time, physical transport cost per kilometer, physical transshipment costs at the borders, ports and airports, and time cost. To set the parameters for the transport cost function, we obtain the probability equivalent distance between truck and air transport, and between truck and sea transport, as in Table 2. The table explains that in the food processing industry, the probability of truck usage will be higher than that of sea transport if the distance to foreign partners is less than 371 kilometers. In this case, because of the assumptions stated above, food processing firms in our model will make use of trucks if the distance to the foreign partners is less than 371 kilometers, and they will ship mainly by sea if the distance is more than 371 kilometers.

In reference to several sources such as the questionnaire survey done by the ERIA innovation and agglomeration project or the ASEAN Logistics Network Map by JETRO, we obtain the parameters as follows: where cdist means physical transport cost per kilometer, speed means speed per hour, ttrans means transaction time for domestic (Dom) and international (Intl), and ctrans means physical transshipment costs at the borders, ports and airports for domestic and international (Table 3).

Table 2: Probability Equivalent Distance between Truck and Air/Sea (km)

	Domestic		International	
	Air	Sea	Air	Sea
Food	60,300,000	3,699	19,254	371
Textiles	2,022,900	11,218	2,968	825
Machineries	44,009	1,899	361	229
Automobile	225,394	7,693	886	628
Others	684,540	5,909	1,634	520

Source: Kumagai *et al.* (2010) based on the IDE/ERIA-GSM 3.

Table 3: Parameters for the Transport Cost Function

	Truck	Sea	Air	Unit	Source
$cdist_M$	1	0.24	45.2	US$/km	Map
$speed_M$	38.5	14.7	800	km/hour	Estimation
$ttrans_M^{Dom}$	0	11.671	9.01	hours	Estimation
$ttrans_M^{Intl}$	13.224	14.972	12.813	hours	Estimation & Map
$ctrans_M^{Dom}$	0	190	690	US$	Map
$ctrans_M^{Intl}$	500	504.2.	1380.1	US$	Estimation & Map

Source: Kumagai *et al.* (2010) based on the IDE/ERIA-GSM 3.

We obtain the time costs for five manufacturing sectors as in Table 4, deriving from the assumptions and the other parameters mentioned above.

Finally, we get the behaviors of firms within the model. For example, an electronics firm in Ayutthaya will ship their products to Lamphun, Thailand, by truck because it is domestic transport. They will ship the products to Phnom Penh in Cambodia by truck and air, precisely from Ayutthaya to Suvarnabhumi Airport by truck, from Suvarnabhumi Airport to Phnom Penh Airport by air, and from Phnom Penh Airport to Phnom Penh city by truck. They will ship the products to Kuala Lumpur in Malaysia only by truck, even though the distance between Ayutthaya and Kuala Lumpur is larger than the distance between Ayutthaya and Phnom Penh. This is because we assume a smooth border transaction between Thailand and Malaysia, while border transaction is tougher between Thailand and Cambodia. Even though we handle a simple transport cost function, the number of patterns of transport routes will be about 16 million, because the IDE/ERIA-GSM (third generation) has 957 regions and six industries with positive transport costs.

Table 4: Parameters for Time Costs

	Food	Textile	Machineries	Automobile	Others
$ctime_s$	15.7	17.2	1803.3	16.9	16.5

Note: The parameter for "Food" is used for the food processing industries in our model; similarly, "Textile" for garments and textiles, "Machineries" for electrical appliances and electronics, "Automobile" for automotive, and "Others" for the other types of manufacturing.

Source: Kumagai *et al.* (2010) based on the IDE/ERIA-GSM 3.

1.2. Examples of IDE/ERIA-GSM and Their Implications

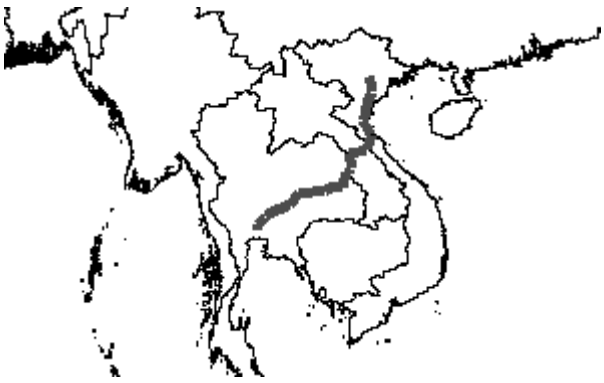
Let us see the examples of transport routes in IDE/ERIA-GSM. Figure 4 shows the economically shortest routes by IDE/ERIA-GSM between Phnom Penh and Sihanoukville and between Phnom Penh and Ho Chi Minh City in the garment and textile industry. The route between Phnom Penh and Sihanoukville in the model is the same as the route firms actually take. They use national road No. 4 because this is the shortest in distance. The route between Phnom Penh and Ho Chi Minh City in the model is also by road, that is, national road No. 1 of Cambodia and national road No. 22 of Vietnam. In reality, some firms use inland waterways from Phnom Penh Port to Ho Chi Minh Port, such as Cat Lai Port, and some firms utilize surface transport as in the model result. In this case, we should remind that IDE/ERIA-GSM 3 has no inland waterways.

Figure 5 draws the economically shortest routes by IDE/ERIA-GSM between Bangkok and Hanoi in the food processing industry. A firm in the model goes over the Second International Mekong Bridge, takes national road No. 12 from Thakhek, crosses the Na Phao/Cha Lo Border and turns left in Ha Tinh. In reality, some firms use surface transport while they have a variety of routes. Multinational firms tend to use the EWEC from Savannakhet to Dong Ha. Some local firms run the national roads

Figure 4: Economically Shortest Routes by IDE/ERIA-GSM between Phnom Penh and Sihanoukville and between Phnom Penh and Ho Chi Minh City (Garment and Textile Industry)

Source: IDE/ERIA-GSM 3.1.

Figure 5: Economically Shortest Route by IDE/ERIA-GSM between Bangkok and Hanoi (Food Processing Industry)



Source: IDE/ERIA-GSM 3.1.

No. 8 or No. 12 in Laos. And more important is that many firms use sea transport. The fact that firms in the model use the Thakhek route and firms in reality, especially multinational firms, do not utilize the Thakhek route implies the existence of obstacles in the route via Thakhek or some advantage of the EWEC in terms of soft

infrastructure. Actually, if we conduct a simulation regarding the development of the EWEC in both physical and soft infrastructure, firms within the model will shift their route from the Thakhek route to the EWEC route.

IDE/ERIA-GSM also tells how the development projects influence the small economies and what measures we have to think of in parallel. As summarized in Table 5 and Table 6, Isono (2010) compares the economic impacts in the two development scenarios. Table 5 shows the top ranked and lower ranked population-gaining regions in Laos by the EWEC development (left-hand side) and the EWEC development with the Third International Mekong Bridge (right-hand side) now under construction. In the EWEC+Third Bridge scenario, we set the development as follows:

1. All measures in the EWEC are implemented.
2. The Third International Mekong Bridge is developed between Nakon Phanom and Thakhek.
3. Customs facilitation is implemented at the Third International Mekong Bridge.

The development of the Third Bridge scenario will benefit Khammouan, whose capital is Thakhek, more than the EWEC scenario. In the EWEC scenario, it gets a 2.2% population gain and a 15.4% GDP gain compared with the baseline scenario. The gains will be raised to 2.5% in population and 17.4% in GDP by the EWEC+Third Bridge scenario. The gains of regions along and south of the EWEC, including Savannakhet, Champasak, Salavan, Attapu and Xekong, will decrease by the development of the Third Bridge, compared with the scenario of EWEC development only.

Table 5: Top Ranked and Lower Ranked Population-Gaining Regions in Laos by the East-West Economic Corridor and the East-West Economic Corridor with the Third International Mekong Bridge

Top Ranked			Lower Ranked		
Region	EWEC	EWEC+Third Bridge	Region	EWEC	EWEC+Third Bridge
Savannakhet	3.8%	3.3%	Oudomxai	-2.8%	-2.9%
Champasak	2.7%	2.3%	Vientiane capital	-2.3%	-1.9%
Salavan	2.3%	1.9%	Louangphabang	-2.3%	-2.2%
Khammouan	2.2%	2.5%	Xiangkhouang	-2.1%	-2.0%
Attapu	1.4%	1.1%	Xaignabouli	-2.0%	-2.1%
Xekong	1.2%	1.1%	Bokeo	-1.9%	-2.1%

Note: Compared with the Baseline Scenario.
Source: Isono (2010) based on the IDE/ERIA-GSM 3.

Table 6: Top Ranked and Lower Ranked GDP-Gaining Regions in Laos by the East-West Economic Corridor and the East-West Economic Corridor with the Third International Mekong Bridge

Top Ranked			Lower Ranked		
Region	EWEC	EWEC+Third Bridge	Region	EWEC	EWEC+Third Bridge
Savannakhet	19.4%	18.9%	Bokeo	-1.0%	-1.2%
Xekong	16.9%	16.8%	Xaignabouli	-0.8%	0.0%
Champasak	15.8%	15.3%	Oudomxai	-0.6%	0.2%
Khammouan	15.4%	17.4%	Louang-Namtha	-0.1%	0.0%
Salavan	14.6%	14.3%	Louangphabang	0.5%	1.8%
Attapu	13.9%	13.6%	Xiangkhouang	0.8%	2.1%

Note: Compared with the Baseline Scenario.
Source: Isono (2010) based on the IDE/ERIA-GSM 3.

We find that Vientiane, the capital of Laos, which shares a border with Thailand by the First International Mekong Bridge, loses population by 2.3% in the EWEC scenario and still loses by 1.9% in the EWEC+Third Bridge scenario. The GDP increase of Vientiane will be relatively small at 3.6% in the EWEC scenario and 5.5% in the EWEC+Third Bridge scenario.

The simulation result of the EWEC+Third Bridge scenario tells us that firms will not change the transport route from the EWEC to the Third International Mekong Bridge when they ship their goods from Bangkok to Hanoi. This is because we only assume customs facilitation at the Third International Mekong Bridge and do not assume it at the Vietnamese side of the road, that is, the Nam Phao/Cau Treo border in the EWEC+Third Bridge scenario[4]. The result shows the importance of customs facilitations in both sides of the borders. In fact, the additional GDP gains by the Third International Mekong Bridge are very small in the model, implying that the lack of coordination between two borders along the road will have a small impact.

We summarize the implications and limitations of IDE/ERIA-GSM and GSM transport costs. GSM transport costs show the economically shortest routes considering distance, speed, transaction time, physical transport cost per kilometer, physical transshipment costs at the borders, ports and airports, and time cost. We can estimate the potential demand of transport and possible economic impacts of various infrastructure projects. Even though we have six industries with positive transport costs,

[4] The results of the baseline scenario, EWEC scenario and EWEC+Third Bridge scenario are consistent with the discussion in Section 2.2. In the baseline scenario, crossing the Na Phao/Cha Lo border is the economically shortest route in the model because there is no Third International Mekong Bridge. In the EWEC+Third Bridge scenario, crossing the Nam Phao/Cau Treo border becomes the shortest in distance while firms in the model continue to use the EWEC thanks to the better border transactions at two borders along the EWEC.

this means we have at most six patterns of transport routes for each pair of cities, because we adopt a simple linear transport cost function. There remains a significant problem in the data. Socioeconomic data as well as logistics data are not provided sufficiently in some countries. Many countries have difficulty collecting and classifying the data precisely due to a lack of sufficient capacity and budget. Data on the road conditions are incorporated insufficiently, leading to adoption of bad routes within the model.

2. POSSIBLE ALTERNATIVE ROUTES RELATED TO THE ECONOMIC CORRIDORS

We discuss two case studies on possible alternative routes, comparing with the main routes. First, we look at the routes along and near the SEC. As for the routes between Phnom Penh and Sihanoukville Port, national road No. 4 is the main route and No. 3 is a possible alternative route. Then, we have a look at the routes between Phnom Penh and Ho Chi Minh City. The route through national road No. 1 in Cambodia and No. 22 in Vietnam is the main route and the route through No.6 and No. 7 in Cambodia and No. 22a in Vietnam is an alternative route. We also introduce national road No. 8, under construction as of November 2010, as another alternative route with high possibility to be used. In addition, we summarize three alternative routes for the route between Bangkok and Hanoi, considering that the route via the EWEC is the main one. A route via No. 12+Ha Tinh, No. 12+No. 8 and No. 8 are compared.

2.1 Possible Alternative Routes Related to the Southern Economic Corridor

We firstly argue on the routes from Phnom Penh to Sihanoukville Port. Sihanoukville Port is a main port of Cambodia and many garments are shipped from it to the EU and the United States. The firms generally use national road No. 4 to the port. However, the route floods about once in three years and this is an obstacle for regular shipment. The port faces competition from Phnom Penh Port, connecting with Ho Chi Minh Port (such as Cat Lai Port) or Cai Mep Port by inland waterway. Moreover, if we have smooth transaction at the Bavet/Moc Bai border and good road infrastructure to Ho Chi Minh Port, then Sihanoukville Port will have to compete with the surface route to Ho Chi Minh City. In fact, Figure 1 shows that the route between Phnom Penh and Ho Chi Minh City has larger demand than the route between Phnom Penh and Sihanoukville.

National road No. 3 is considered as an alternative road to No. 4. Based on a passenger car trial by the author, the total distance from Phnom Penh to Sihanoukville via No. 3 is 252.8 kilometers, about 21 kilometers longer than the route via No. 4 (Table 7). In this regard, No. 3 will not overcome No. 4, while it can be a good alternative route when No. 4 incurs flooding. No. 3 also can accept transport demand from Kampot and Takeo provinces to Sihanoukville Port.

We have to note three things about national road No. 3. Firstly, the road is under improvement. As of November 2010, some bridges were under construction and we had to go by temporary bridges. Secondly, the road has no community road along the main motorway. This results in low speed for container trucks due to many tractors, bicycles, foot passengers and even herds of cows in the road. It also raises the risk of accidents. We need to have a community road along No. 3 just as No. 4 has an unpaved

Table 7: Road Transport Distance from Phnom Penh to Sihanoukville (km)

Main Route (No. 4)		Alternative Route (No. 3)	
Phnom Penh to the intersection of No.4 and No.3 in the Phnom Penh capital (*Congested*)	14.8	←	14.8
Between the two intersections via National Route No. 4 (*Good*)	168.8	Between the two intersections via National Route No. 3 (*Under improvement as of 2010*)	189.7
Intersection of No.4 and No.3 in Sihanoukville province to Sihanoukville (*Good*)	48.3	←	48.3
Total	**231.9**	**Total**	**252.8**

Source: Passenger-car trials by the author.

community road beside the main road. Thirdly, if we ship the goods from Phnom Penh, No. 3 shares the road with No. 4 for 14.8 kilometers. The shared road, Russian Boulevard, is one of the most congested roads in Phnom Penh (See Figure 12 in Chapter 3).

In addition, we compare the surface routes from Phnom Penh to Ho Chi Minh City. Many firms use national road No. 1 in Cambodia to the Bavet/Moc Bai border and national road No. 22 in Vietnam from the border to Ho Chi Minh City. The total distance is 244 kilometers. The main problem is that there is a missing link at Neak Loeung. They have to take ships to cross the Mekong River. It is said that taking national road No. 7 in Cambodia is an alternative route for avoiding the missing link of the main route (Table 8).

However, the total distance of the alternative route is 331 kilometers, which means

Table 8: Road Transport Distance from Phnom Penh to Ho Chi Minh City (km)

Main Route (No. 1)		Alternative Route (No. 7)	
Phnom Penh to Bavet / Moc Bai Border (*Missing link at Neak Loeung*)	183	Phnom Penh to Trapeang Phlong / Xa Mat Border (*So-so*)	202
Bavet / Moc Bai Border to the intersection in Go Dau (*So-so*)	9	Trapeang Phlong / Xa Mat Border to the intersection in Go Dau (*So-so*)	77
Intersection in Go Dau to Ho Chi Minh City (*Congested*)	52	←	52
Total	**244**	**Total**	**331**

Source: Ishida (2007) and passenger-car trials by the author.

it is 87 kilometers longer than the main route. Trapeang Phlong and Xa Mat have poor border facilities and transship yards so far. In fact, an interview result with the Trapeang Phlong border gate reveals that the gate accepts some trucks with textiles from Vietnam to Cambodia but that there are very few trucks with garments from Cambodia to Vietnam. The gate mainly handles the transaction of rubber from Cambodia to Vietnam and consumption goods from Vietnam to Cambodia. In that Cambodian garments are mainly shipped to the EU and the United States via Ho Chi Minh City/Cai Mep Port or Sihanoukville Port, and rubber is produced along national road No. 7, we can conjecture that the border accepts transport demand between Northern Cambodia and Vietnam as in Figure 6, and between Northern Vietnam and Cambodia. This means the route via national road No. 7 is not an exact alternative route between Phnom Penh and Ho Chi Minh City.

Figure 6: Economically Shortest Route by IDE/ERIA-GSM between Kratie and Ho Chi Minh City (Other Manufacturing Industry)

Source: IDE/ERIA-GSM 3.1.

We also have the development project of national road No. 8. A Chinese company has already constructed a bridge over the Mekong River about 26.6 kilometers north of Phnom Penh. As of November 2010, 82.7 kilometers of pavement from the intersection of national road No. 6 and No. 8 just near the bridge was completed. The company had intended to be done by March 2010, but they had to interrupt pavement during the rainy season. After completion, maybe in early 2011, No. 8 will connect to the road near the Trapeang Phlong border, and as such would be another alternative route. Especially due to the missing link of national road No. 1, national road No. 8 will be a competitive alternative route to the main route between Phnom Penh and Ho Chi Minh City because it will shorten the distance compared with the current route by national road No. 7.

2.2 Possible alternative routes related to the East-West Economic Corridor

Next, we compare several routes between Bangkok and Hanoi. The transport is mainly done by national road No. 9 of Laos and Vietnam, that is, the EWEC route. The distance between Bangkok and Hanoi via the EWEC is 1,587 kilometers. On the other hand, the

distance via national road No. 12 or No. 8 is shorter than the EWEC route. Moreover, Thailand and Laos have a development project of the Third International Mekong Bridge between Nakhon Phanom and Thakhek, so after completion of the bridge the competitiveness of No. 12 and No. 8 will be raised.

We have mainly three candidates of alternatives to the EWEC route (Table 9). The first and second ones are the routes via the Third International Mekong Bridge and national road No. 12. The No. 12 road starts in the outskirts of Thakhek city and connects to national road No. 13. The projected site of the Third International Mekong Bridge is 12.7 kilometers north by No. 13 from the intersection of No. 12 and No. 13. The distance from the intersection to the Na Phao/Cha Lo border is 146.2 kilometers. When the author drove the road in December 2010, many container trailers in a row were seen at the border.

Table 9: Road Transport Distance from Bangkok to Hanoi (km) (Continues)

Main Route (EWEC)	
Bangkok to Mukdahan / Savannakhet Border (Second International Mekong Bridge) (*Excellent*)	662
Second International Mekong Bridge to Densavanh / Lao Bao Border (*So-so*)	238
Densavanh / Lao Bao Border to Hanoi (*Low speed but good*)	687
Total	**1,587**

Table 9: Road Transport Distance from Bangkok to Hanoi (km) (Continued)

Possible Alternative Route (No. 12 and via Ha Tinh)		Possible Alternative Route (No. 12 and 8)	
Bangkok to Nakhon Phanom / Thakhek Border (Third International Mekong Bridge) (*Very good*)	784.3	←	784.3
Third International Mekong Bridge to Na Phao / Cha Lo Border (*Good*)	158.9	←	158.9
Na Phao / Cha Lo Border to the intersection of No. 12 and Ho Chi Minh Highway (*Low speed but good*)	38.1	←	38.1
Intersection of No. 12 and Ho Chi Minh Highway to the intersection to No. 15 (*Low speed but good*)	57.8	Intersection of No. 12 and Ho Chi Minh Highway to the intersection of Ho Chi Minh Highway and No.8 (*Low speed but good*)	99.8
Intersection to No. 15 to Ha Tinh (*Paved but Very Bad*)	33.3	Intersection of Ho Chi Minh Highway and No.8 to the intersection to No.1 (*Low speed and so-so)*	34.3
Ha Tinh to Hanoi (*Low speed but good*)	357.0	Intersection to No.1 to Hanoi (*Low speed but good*)	328.0
Total	**1429.4**	**Total**	**1443.4**

Possible Alternative Route (No. 8)	
Bangkok to Nakhon Phanom / Thakhek Border (Third International Mekong Bridge) (*Very good*)	784.3
Third International Mekong Bridge to Vieng Kham (*Good*)	87.0
Vieng Kham to Nam Phao / Cau Treo Border (*Mountainous*)	130.5
Nam Phao / Cau Treo Border to the intersection to No. 1 (*Very mountainous → Low speed and so-so*)	82.1
Intersection to No. 1 to Hanoi (*Low speed but good*)	328.0
Total	**1411.9**

Source: Ishida (2007) and passenger-car trials by the author.

From the Na Phao/Cha Lo border to Hanoi, we can consider two routes, namely, via Ha Tinh and via No. 8 (see again Figure 3). The route via Ha Tinh is shorter than the one via No. 8, while the road conditions of the route to Ha Tinh by national road No. 15 and provincial road No. 3 are very bad. As of December 2010, the road was paved but had a width that was too narrow for passing the container trailers both ways (Figure 7). We only saw passenger cars and trucks with logs or consumer goods. The route via national road No. 8 is much better in terms of the road conditions.

The third candidate is the route using the Third International Mekong Bridge and national road No. 8 fully. National road No. 8 in Laos and Vietnam runs from Vieng Kham in Laos to the Nam Phao/Cau Treo border and intersects with Ho Chi Minh Highway before merging into national road No. 1 of Vietnam. It is 87 kilometers from the Third International Mekong Bridge projected site to Vieng Kham. The total length of No. 8 is 212.6 kilometers and the total distance between Bangkok and Hanoi will be

Figure 7: National Road No. 15, Connecting to Provincial Road No. 3 to Ha Tinh

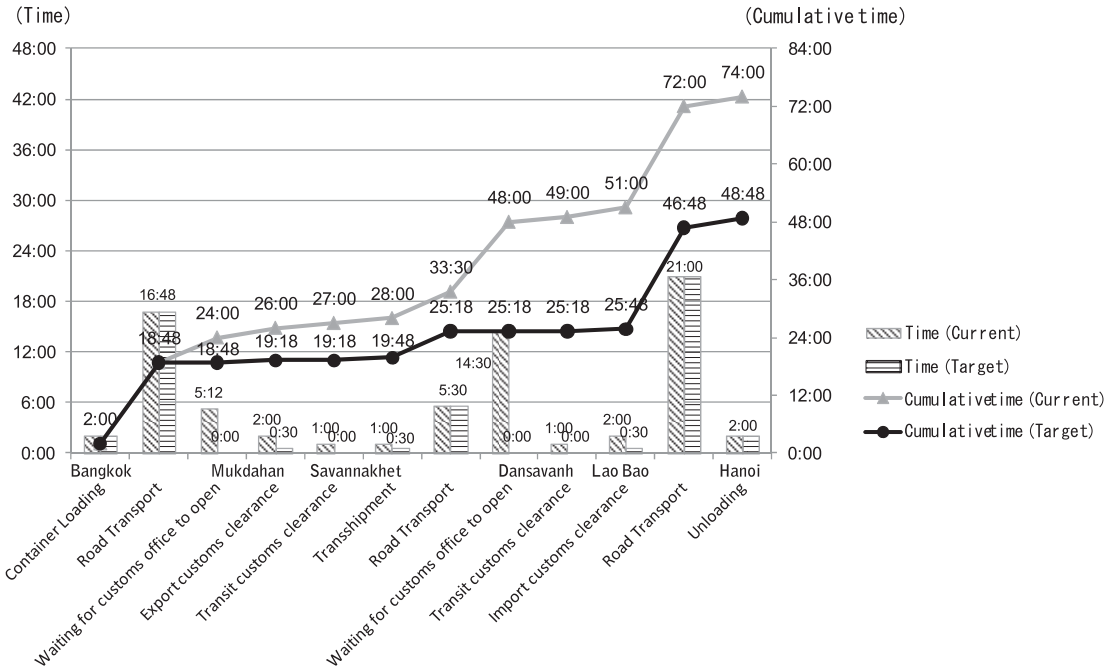
Source: Author.

1,411.9 kilometers after completion of the Third International Mekong Bridge. This distance is the shortest among the EWEC route and the other three alternative routes. Even so, this road has a narrow and mountainous section between the Nam Phao/Cau Treo border and the intersection with Ho Chi Minh Highway. The No. 8 road is mainly used by buses connecting Vientiane to several cities in Vietnam, and there are a few container trailers in evening due to the narrow and mountainous section.

Let us summarize the comparison. The EWEC route has the most gradual slope, best road conditions and longest distance among the four routes. Based on an interview with a car driver, he prefers the EWEC route among the four routes considering road conditions, safety and traffic congestion. All of this is why many manufacturing firms, especially Japanese multinational firms, utilize this route instead of the other ones.

Other reasons why firms use the EWEC are related to the precedence of customs facilitation and investment promotion. It is said that the Lao government allows its borders on the EWEC to take lower transaction fees from the trucks which trade between Thailand and Vietnam, compared with the other borders. Initial implementation of the Cross Border Transport Agreement (CBTA) is proceeding at two borders along the EWEC, namely, Mukdahan/Savannakhet and Dansavanh/Lao Bao. JETRO (2008) pointed out that there is higher potential for logistic improvement between Bangkok and Hanoi through customs facilitation. Figure 8 shows a potential logistic improvement along the EWEC. The current transport time from Bangkok to Hanoi based on an actual experiment is 74 hours. It includes not only the time for road transport but also loading, unloading and transshipment time, time for customs clearance, and even time waiting for the customs office to open. If we adopt single-stop inspection at the two borders along the EWEC and reduce the waiting time

Figure 8: Potential Logistic Improvement along EWEC



Source: Author compiled from JETRO (2008).

at customs and the time for transshipment, it can reasonably be reduced by 34% to 48.8 hours. Savannakhet has a special economic zone (SEZ) project. Sites B and C of the Savan-Seno SEZ are already in operation. Because shipping costs are thought to have large-scale economy, the existence of transport demand by the SEZ will decrease the transport costs significantly.

Meanwhile, both the Na Phao/Cha Lo and Nam Phao/Cau Treo borders have seen a substantial increase in border trade volume. The Cha Lo border on national road No. 12 handled USD 13 million in trade and 36,000 people in 2006. This has greatly increased to USD 59 million in trade and 151,000 people. The Cau Treo border on national road No. 8 handled USD 62 million in trade and 275,000 people in 2008. It

increased to USD 87 million in trade and 348,800 people from January to October, 2010. The two borders also handle transit transport among Thailand, Vietnam and China. At the Na Phao/Cha Lo border, garments are shipped from China to Thailand and fruit and livestock are sent from Thailand to Vietnam or China. The Nam Phao/Cau Treo border accepts trucks with maize, sports drinks and electronics from Thailand to Vietnam or China, and clothes from China to Thailand, and tea from Vietnam to Thailand.

Each border has a plan to increase staff and improve services to meet with the possible increase of traffic after completion of the Third International Mekong Bridge. Nam Phao customs already has an inspection yard with an X-ray system. Na Phao will make an inspection yard with an X-ray system 20 kilometers from the border. The Cha Lo border will establish a new warehouse 15 kilometers from the border. It is said that there are several issues such as poor road infrastructure, insufficient communications among customs, immigration and quarantine at the same border office, no successful case of attracting direct investment, different opening hours at the border offices between the Lao and Vietnamese sides, and higher transaction fees compared with the borders along the EWEC. However, because the revenue from transaction fees belongs to the provinces, Khammouan Province in having national road No. 12 and Bolikhamxai Province in having national road No. 8 gives priority to the physical infrastructure improvement of the roads and reducing the time and procedures at the borders. In fact, Bolikhamxai Province has a plan to establish a new international gate with Thailand in Vieng Kham, and a further plan to upgrade the connection from the ship transport crossing the Mekong River to a new international Mekong bridge.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

We compare several alternative routes with main routes. The alternative routes have potential and issues in different ways. We find that physical infrastructure improvement is still on the issue list.

We also find the limitation and possibility of the GSM transport costs. Using the GSM transport costs, we can detect routes with the highest potential, while we need further efforts to fill in the gaps between the model and the reality by collecting a sound data-set of road width and conditions, etc. International cooperation is recommended to harmonize the data. The accuracy of data is essential to conduct credible simulations.

Isono (2010) mentioned the possibility of competition among provinces in terms of customs facilitation and investment promotion. We find that such competition has already started. We should identify what kind of coordination should be sought and implemented to avoid unnecessary duplication of efforts and to maximize the benefits. And for that, both large-scale research by a simulation such as IDE/ERIA-GSM and detailed research by interviews and fixed-point observations are required.

REFERENCES

Behrens, Kristian; Andrea R. Lamorgese; Gianmarco I.P. Ottaviano; and Takatoshi Tabuchi (2004) "Testing the 'home market effect' in a multi-country world." CEPR Discussion Papers 4468.

____ (2009) "Beyond the home market effect: Market size and specialization in a multi-country world." *Journal of International Economics* Vol. 79(2), 259-65.

Fujita, Masahisa; Paul Krugman; and Tomoya Mori (1999) "On the evolution of hierarchical urban systems." *European Economic Review* 43, 209-51

Fujita, Masahisa; Paul Krugman; and Anthony J. Venables (1999) *The Spatial Economy: Cities, Regions, and International Trade.* Cambridge, MA: MIT Press.

Ishida, Masami and Toshihiro Kudo (2007) *Greater Mekong Subregion Economic Cooperation: Realizing Three Economic Corridors* [in Japanese]. Chiba: Institute of Developing Economies

Ishida, Masami (2010) *Focusing on Economies of Border Area in Mekong Region* (in Japanese). Chiba: Institute of Developing Economies.

Isono, Ikumo (2010) "Eonomic Impacts of the Economic Corridor Development in Mekon Region" In *Investment Climate of Major Cities in CLMV Countries*, BRC Research Report No. 4, ed., Ishida, Masami, Bangkok: Bangkok Research Center, IDE-JETRO.

JETRO (2008) *ASEAN Logistics Network Map 2008*, JETRO (in Japanese).

Kawada, Atsusuke (2009) "The transport time from Bangkok to Hanoi can be shortened substantially" (in Japanese), Tsusho Koho, JETRO, December 10, 2009

Krugman, Paul (1991) "Increasing Returns and Economic Geography." *Journal of*

Political Economy 99(3): 483-99.

_____ (1993) “The hub effect: or, threeness in international trade”, in *Trade Policy and Dynamics in International Trade*, eds. W.J. Ethier, E. Helpman and J.P. Neary , Cambridge: Cambridge University Press, 29-37.

Kumagai, Satoru; Toshitaka Gokan; Isono Isono; and Souknilanh Keola (2008) “Predicting Long-Term Effects of Infrastructure Development Projects in Continental South East Asia: IDE Geographical Simulation Model.” ERIA Discussion Paper Series, No.2008-02.

_____ (2009) “The Second Generation of Geographical Simulation Model: Predicting the Effects of Infrastructure Development by Industry.” in *Development of Regional Production and Logistic Networks in East Asia*, ed. Kitti Limskul, ERIA Research Project Report 2008 No. 4-1.

Kumagai, Satoru; Toshitaka Gokan; Ikumo Isono; Souknilanh Keola; and Kazunobu Hayakawa (2010) *Geographical Simulation Analysis for Logistic Enhancement in East Asia,* ERIA Research Project Report 2009 No.7-2.