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Connecting South Asia to Southeast Asia: Cross-Border Infrastructure Investments

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Abstract

South Asia and Southeast Asia have been connected for many centuries, with the degree of connectivity varying over time. This paper explores strengthening connectivity between the two subregions by identifying the missing links in transport connectivity. The paper is specifically concerned with the role of cross-border transport infrastructure investments. To this end, the author reviews all possible road and rail land corridors that would help create seamless transport connectivity. Missing gaps and corresponding transport infrastructure projects are identified, and projects are screened and prioritized. For the selected critical projects, the study recommends phased investments.

JEL Classification: H41, H54, O22, F36

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Contents

1. INTRODUCTION

South Asia and Southeast Asia have been connected for many centuries, with the degree of connectivity varying over time. As part of a study to analyze how to strengthen that connectivity, this paper is concerned with the role of cross-border transport infrastructure investments to improve connectivity.

There is no doubt that most of the trade between South Asia and Southeast Asia is by sea. History confirms that trade, religion, and culture were brought from South Asia to Southeast Asia by sea as mountains acted as natural barriers between India and Myanmar. However, the underlying hypothesis of this report is that with improved infrastructure and easier border crossing procedures, goods and passenger traffic by land would grow. Empirical studies have confirmed that trade costs and infrastructure quality are strongly correlated with trade volumes and gross domestic product (GDP).[1]

Though increasing, trade between South Asia and Southeast Asia is still low.[2] Trade of South Asia with the Greater Mekong Subregion (GMS) and Association of Southeast Asian Nations (ASEAN) countries accounted for 2% and 7% of their total trade, respectively.[3] Trade through land routes constitutes a very small portion of that trade. Trade by land between India and Myanmar is indeed very low, but significant trade by land takes place between Thailand and Myanmar.[4] There are many reasons for the lack of connectivity and trade between India and Myanmar through the Northeast Indian states. These states are still isolated from the rest of India and do not have much to offer economically. Insecurity has also been a serious obstacle. There are, however, signs of change for the better.

This paper first reviews all possible road and rail land corridors which could strengthen connectivity between South Asia and Southeast Asia. To fill the missing gaps, a series of transport infrastructure projects are identified. Projects are then screened and prioritized. For the selected projects, phased investments are recommended.

2. SOUTH ASIA–SOUTHEAST ASIA TRADE AND TRANSPORT CORRIDORS

Transport connectivity exists between South Asia and Southeast Asia, but in a rather primitive way. Making it seamless, whether by road or rail, would require building many

[1] See the contributions of Limao and Venables (2001), De (2008), Edmonds and Fujimura (2008), Banik and Gilbert (2010), Stone and Strutt (2010), Brooks (2010), and Stone, Strutt, and Hertel (2012).

[2] There are different ways of defining South Asia and Southeast Asia. Because of the focus on land connectivity, South Asia is associated with the South Asia Subregional Economic Cooperation (SASEC) Program (Bangladesh, Bhutan, Nepal, and Eastern and Northeast India [Bihar, West Bengal, and the Northeast States]). Southeast Asia is usually associated with the Association of Southeast Asian Nations, but here the focus is on the Greater Mekong Subregion (GMS) countries (Cambodia, the Lao People's Democratic Republic, Myanmar, Thailand, Viet Nam, and Yunnan Province in the People's Republic of China). SASEC trade with the GMS was $45 billion out of $615 billion in 2010, though it reached $55 billion in 2012 (ADB and ADBI 2013).

[3] See ASEAN (2011) and United Nations Statistical Division, Comtrade.

[4] Trade between Myanmar and India in 2010 was $1.5 billion, of which Myanmar's exports to India comprised $1.3 billion, and Myanmar's imports from India equaled $0.2 billion. Of that trade, less than $4 million was recorded at the main border crossing point (BCP) of Moreh/Tamu. The situation is quite different for border trade between Thailand and Myanmar. The total trade between the two countries in 2012 was $5.6 billion, with $3.43 billion being Thailand's imports from Myanmar (95% gas products) and $2.17 billion being exports from Thailand to Myanmar. In 2012, at Mae Sot BCP alone, Thai exports were recorded at approximately $150 million–$200 million, or 10% of total exports (RIS 2011; Chirathivat 2013).

missing links. The cost of these infrastructure investments would be high and therefore would need to be carried out on optimal routings. Currently, South Asia connects with Southeast Asia only by road, and therefore road corridors are reviewed with priority.

Questions have been raised on the practicality of a corridor concept. Transport corridors are simply optimal routes from gateway point to gateway point, where the gateway points are usually major ports. This does not mean that sizeable traffic volumes would move between the extremities, but in the long run there are economic benefits in connecting the ports. This has been the concept used in defining Central Asia Regional Economic Cooperation (CAREC) transport corridors and GMS corridors. Corridors do not need to be single-mode only and for instance some of the CAREC corridors are multimodal.

2.1 South Asia–Southeast Asia Road Corridors

There has been a series of initiatives to support the realization of improved land connectivity between South Asia and Southeast Asia. They are the India–Myanmar–Thailand Trilateral Highway Project, the Mekong–India Economic Corridor (MIEC), the Kaladan Multimodal Transit Transport Project, and the Delhi–Ha Noi Railway Link. The corridors defined below are consistent with these initiatives. On the South Asia side all corridors originate from the Gulf of Bengal ports, Kolkata and Chittagong. On the Southeast Asia side, road corridors typically follow existing GMS corridors with the eastern gateway port in the Mekong Delta being Ho Chi Minh City, though Da Nang and Hai Phong are also gateway ports that are included.

2.1.1 South Asia Road Corridors

South Asia, under the South Asia Subregional Economic Cooperation (SASEC) Program, includes only Northeast Indian states plus their neighbors directly connected to them: Nepal, Bangladesh, Bhutan, Uttar Pradesh, Bihar, and West Bengal. In all cases, Kolkata and Chittagong are both the gateway ports. Discussions about transport corridors from South Asia to Southeast Asia involve India and Bangladesh as they both connect with Myanmar, but corridors have to offer access to Nepal and Bhutan as well.

Nepalese goods could reach Myanmar and the Mekong by road either through the “Chicken’s Neck” or through Bangladesh. The designed corridors follow South Asian Association for Regional Cooperation (SAARC) corridor definitions and are consistent with Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) views. In Northeast India, Siliguri is a major hub for Sikkhim, Bhutan, and Nepal. Siliguri is located at 560 kilometers (km) from Kolkata and approximately 1,150 km from the Myanmar border at Moreh.

The vast majority of Bhutan exports and imports transit to India via the Phuentsholing border crossing point (BCP). The distances from Phuentsholing to BCPs or ports are as follows:

- Phuentsholing to the Myanmar border, Moreh BCP, 845 km (through Guwahati and Imphal);
- Phuentsholing to the Bangladesh border, Burimari BCP, 110 km;
- Phuentsholing to Chittagong Port, 972 km (through Burimuri and Dhaka); and
- Phuentsholing to Kolkata Port, 725 km (through Siliguri).

It is clear from the above that transiting through Bangladesh is not a viable option for Bhutan trade with Southeast Asia. Bhutan international trade currently goes through Kolkata Port. In the future this will continue to be the case for all trade as well as for trade in Southeast Asia. However, with improved road conditions, some trade could follow the Assam highway and reach the Myanmar border at Moreh.

Because of its geographic location, the vast majority of Nepalese trade with India and the rest of the world is through border crossings located in South Nepal. By order of trade value they are: Birgunj, Biratnagar, Bairahawa, and Nepalgunj. Most of Nepalese trade is with India (65%) but the rest of international trade transits through Kolkata Port (or eventually Haldia Port). However, when traveling by road, Nepalese trade with Bangladesh and Southeast Asia uses the eastern border crossing of Karkavita. The distances from Karkavita to BCPs or ports are the following:

- Karkavita to the Myanmar border, Moreh BCP, 1,000 km (through Siliguri, Assam highway, and Shillong), and 1,180 km through Nagaon;
- Karkavita to the Bangladesh border, Phulbari/Banglabandha, 47 km;
- Karkavita to Chittagong Port, 781 km (through Dhaka);
- Karkavita to Kolkata Port, 556 km; and
- Karkavita to the Myanmar border, Moreh BCP, through Bangladesh, 1,206 km (through Dhaka, Agartala, Silchar, and Imphal).

It is also clear that there are no clear advantages for Nepalese goods to pass through Karkavita BCP when transiting through Bangladesh for exporting/importing in general, or for carrying out trade with Southeast Asia. Chittagong is not an interesting option compared to Kolkata, and reaching the Myanmar border is longer through Bangladesh than through the Indian Chicken's Neck (1,206 km compared to 1,000 km).

However, for Indian goods, the Bangladesh road corridor to Southeast Asia is available. This corridor links Benapole BCP, Dhaka, and Agartala (Tripura in Northeast India) before continuing to Silchar (Assam) and Moreh (Manipur). Bangladesh has a border crossing with Myanmar at Teknaf, but vehicles and people are not permitted to enter Myanmar at this BCP.

Indian goods originating from the Kolkata region could reach the southeast region by land through Bangladesh or through the Chicken's Neck and the Assam highway. The comparative distances are:

- Kolkata to the Myanmar border, Moreh BCP, through Bangladesh, 1,112 km (through Benapole, Dhaka, and Agartala); and
- Kolkata to the Myanmar border, Moreh BCP, through the Chicken's Neck/Assam highway, 1,558 km through Siliguri, Guwahati, Shillong, and Silchar, and 1,713 km through Siliguri, Nagaon, and Silchar.

Based on distance, there is a definitive advantage to reaching Myanmar through Bangladesh when starting from Kolkata. Taking the above into consideration there are five possible road corridors that could be suggested for the South Asia side: the Kolkata Chicken's Neck Corridor (Manipur), the Nepal–Bangladesh Corridor, the Kolkata–Bangladesh Corridor, the Kolkata Chicken's Neck Corridor (Mizoram), and the Chittagong Corridor (see Table 1).

Table 1: South Asia Possible Road Corridors

Origin	Destination	Distance (kilometers)	Road
1. Kolkata–Chicken's Neck Corridor Manipur			
Kolkata	Siliguri	560	NH 34, NH 31
Siliguri (West Bengal)	Guwahati (Assam)	485	NH 31
Guwahati (Assam)	Nagaon	128	NH 37
Nagaon	Silchar (Assam)	285	NH 54
Silchar (Assam)	Imphal (Manipur)	160	NH 137
Imphal (Manipur)	Moreh BCP (Manipur)	95	NH 39, AH 2
Total		1,713	
2. Nepal–Bangladesh Corridor			
Karkavita (Nepal)	Phulmari/Banglabandha	47	NH 31, NH 31C
Banglabandha	Dhaka	489	N5
Dhaka	Agartala (Tripura)	155	N1, N102
Agartala	Silchar (Assam)	267	NH 44
Silchar	Imphal (Manipur)	160	NH 137
Imphal	Moreh BCP (Manipur)	95	NH 39, AH 2
Total		1,213	
3. Kolkata–Bangladesh Corridor			
Kolkata	Benapole (Bangladesh)	80	NH 34, NH 35
Benapole	Dhaka	355	N 706, N7, N5
Dhaka	Agartala (Tripura)	155	N1, N102
Agartala	Silchar (Assam)	267	NH 44
Silchar	Imphal (Manipur)	160	NH 137
Imphal	Moreh BCP (Manipur)	95	NH 39, AH 2
Total		1,112	
4. Chittagong Corridor			
Chittagong	Dhaka	245	N1
Dhaka	Agartala (Tripura)	155	N1, N102
Agartala	Silchar (Assam)	267	NH 44
Silchar	Imphal (Manipur)	160	NH 137
Imphal	Moreh BCP (Manipur)	95	NH 39, AH 2
Total		922	
5. *Kolkata–Chicken's Neck Corridor Mizoram*			
Kolkata	Siliguri	560	NH 34, NH 31
Siliguri (W Bengal)	Guwahati (Assam)	485	NH 31
Guwahati (Assam)	Nagaon	128	NH 37
Nagaon	Silchar (Assam)	285	NH 54
Silchar (Assam)	Aizwal (Mizoram)	140	NH 54
Aizwal	Lawngtlai (Mizoram)	150	NH 54
Lawngtlai	Mobu BCP (Myanmar)	117	New road
Total		1,865	

BCP = border crossing point.

Source: Author's estimates.

Not all the above corridors should be retained for analysis. Corridor 1 (the Kolkata–Chicken's Neck or Assam Corridor) was designed to represent the maximum "hinterland" for the land connection with Myanmar. Besides attracting the possible Northeast India trade with Southeast Asia, it also provides a passage for Nepal trade (Karkavita) and possible Bhutanese trade (Phuentsholing). Corridor 2 should be discarded as there are no advantages for Nepalese goods to transit through Bangladesh (additional border crossing and longer distance). The Chittagong Corridor (corridor 4) is given for reference. It cannot be considered a main corridor but could eventually qualify as a feeder corridor. Bangladesh has not yet confirmed transit facilities for Northeast Indian goods and there are no reasons to

expect significant trade volumes between Chittagong Port, Myanmar, and the rest of Southeast Asia.

Therefore, the main road corridor originating from South Asia toward Southeast Asia is the Kolkata–Chicken's Neck Corridor and the Kolkata–Bangladesh Corridor. The Bangladesh Corridor has the advantage of providing a passage for Bangladeshi trade with Southeast Asia as well as being a shorter distance (631 km) than the Chicken's Neck Corridor.

The Chicken's Neck Corridor has two variants: one reaches to the Moreh BCP in Manipur and the other to Myanmar through Mizoram at Mobu. The two variants are retained for this analysis. To reach Silchar from Guwahati, an alternative, shorter route would be through Shillong in Meghalaya. The current Assam four-lane project, however, passes through Nagaon.

2.1.2 Southeast Asia Road Corridors

As mentioned before, road corridors leading to South Asia will be GMS corridors. Traditionally Ho Chi Minh City has been the gateway port. Road corridors originating from the port leading to South Asia are easy to choose. The choice of optimal routing is, however, more difficult if, in addition to Ho Chi Minh City, Hai Phong is added as a gateway port.

The nine GMS road corridors are the following:

- Northern Corridor: Border of Myanmar and India (Tamu)–Kunming (Yunnan Province, People's Republic of China [PRC])–Nanning, Fancheng (Guangxi Zhuang Autonomous Region, PRC);
- North–South Corridor: Kunming–Tachilek (Myanmar)–Chiang Rai (Thailand)–Bangkok (Thailand) or Kunming–Boten (Lao People's Democratic Republic [Lao PDR])–Chiang Khong (Thailand)–Chiang Rai (Thailand)–Bangkok;
- Eastern Corridor: Kunming–Ha Noi–Ho Chi Minh City–Ca Mau (Viet Nam) or Nanning–Ha Noi or Fangcheng–Hai Phong–Ha Noi;
- Northeastern Corridor: Bangkok–Luang Phrabang (Lao PDR)–Than Hoa (Viet Nam);
- Central Corridor: Sattahip/Laem Chabang (Thailand)–Vientiane (Lao PDR)–Boten (Lao PDR) or Sihanoukville (Cambodia)–Phnom Penh (Cambodia)–Pakse (Lao PDR)–Vientiane (Lao PDR)–Boten (Lao PDR);
- East–West Economic Corridor: Mawlamyine (Myanmar, Andaman Sea)–Khon Kaen (Thailand)–Mukdahan (Thailand)–Savannakhet (Lao PDR)–Dong Ha (Viet Nam)–Da Nang (Viet Nam);
- Southern Coastal Corridor: Bangkok–Trat (Thailand)–Sihanoukville (Cambodia)–Ha Tien (Viet Nam)–Nam Cam (Viet Nam);
- Southern Corridor: Dawei (Myanmar, Andaman Sea)–Bangkok–Phnom Penh–Bavet (Cambodia)–Ho Chi Minh City–Vung Tau (Viet Nam) or Bangkok–Siem Reap (Cambodia)–Sung Treng (Cambodia)–Quy Nhon (Viet Nam); and
- Western Corridor: Border of Myanmar and India (Tamu)–Naypyitaw (Myanmar)–Mawlamyine (Myanmar).

In Table 2, seven possible road corridors are listed. This does not mean that all corridors would be economically justifiable, and some corridors are simply variants of more common corridors.

The most geographically natural GMS corridors for South Asia connectivity are the Southern Corridor originating from Saigon Port in Ho Chi Minh City and Vung Tau leading to Dawei

Port in Myanmar; and the East–West Economic Corridor originating from Da Nang (Viet Nam) to Mawlamyine (Myanmar) and leading to Yangon. This last corridor, when added to the GMS Western Corridor in Myanmar, provides land access to South Asia through the Tamu/Moreh BCP.

Myanmar authorities would like to see the corridor pass through Mandalay.[5] This is because in addition to being the second largest city in Myanmar, Mandalay is also a strategic node for transportation to the PRC and Thailand.

An interesting possible corridor could combine the GMS Southern Corridor and East–West Economic Corridor to give a route from Saigon Port to Myawaddy/Mae Sot BCP, passing through Bangkok and Tak. This route would have more economic potential than the East–West Economic Corridor even though the distance is longer by about 200 km.[6]

The India-sponsored multimodal Kaladan project was mentioned before under the South Asia corridors, and its counterpart road section in Myanmar is included below.

There are two possible routes to connect Ho Chi Minh City to Dawei in Myanmar. The first and more common is the GMS Southern Corridor through Phnom Penh and Bangkok, with the second one being through the Mekong Delta along the GMS South Coastal Corridor. The development of a deep sea port in Dawei with an adjacent special economic zone is presented as the key element to foster trade between Chennai Port and Southeast Asia and this is viewed as a promising maritime corridor.

The Ha Noi/Hai Phong–India corridors are described below as they have been mentioned by Indian and Myanmar authorities. Two options could be considered, through Luang Prabang and Vinh or through Dien Bien Phu. Both routes would be convoluted and major road rehabilitation and construction of missing links would be needed along the corridors and especially in Lao PDR. The option through Dien Bien Phu is the one preferred by the GMS administration.

[5] This is confirmed in the Myanmar section of BIMSTEC (2014).

[6] EWEC has not reached the expected potential. There are many reasons for this with the most obvious being the fact that Da Nang Port still remains a small port compared to Ho Chi Minh and Hai Phong.

Table 2: Possible Southeast Asia Corridors

Origin	Destination	Distance (kilometers)	Road
1. East–West Economic Corridor–India Corridor			
Da Nang (Viet Nam)	Dong Ha	170	V1
Dong Ha (Viet Nam)	Lao Bao (BCP)	80	V9
Dansavan (Lao PDR)	Savannakhet (Lao PDR)	253	RN 9
Savannakhet	Khon Kaen (Thailand)	210	T2042, T213
Khon Kaen	Phitsanulok (Thailand)	280	T12
Phitsanulok	Mae Sot (BCP)	215	T12, T105
Myawaddy (BCP)	Kawkareik (Myanmar)	60	NH 85
Kawkareik	Endu	70	NH 85
Endu	Tathon	60	NH 85
Tathon	Bago	150	NH 85
Bago	Naypyidaw	270	NH 1
Naypyidaw	Mandalay	252	NH 1
Mandalay	Monywa	99	71
Monywa	Yagyi	62	71
Yagyi	Kalewa	92	71
Kalewa	Tamu (BCP)	211	NH 39
Total		2,534	
2. Saigon Port–India Corridor			
Saigon Port/Vung Tau	Moc Bai (BCP)	80	N1, NH22
Bavet (BCP)	Phnom Penh (Cambodia)	158	RN1
Phnom Penh	Poipet (BCP)	365	RN5
Aranyaprathet (BCP)	Bangkok (Thailand)	324	NH33, NH314, N 7,4
Bangkok	Tak	423	EHWY 13 and 1
Tak	Mae Sot (BCP)	78	NH 105
Myawaddy (BCP)	Kawkareik (Myanmar)	60	NH 85
Kawkareik	Endu	70	NH 85
Endu	Tathon	60	NH 85
Tathon	Bago	150	NH 85
Bago	Naypyidaw	270	NH 1
Naypyidaw	Mandalay	252	NH 1
Mandalay	Monywa	99	71
Monywa	Yagyi	62	71
Yagyi	Kalewa	92	71
Kalewa	Tamu (BCP)	211	NH 39
Total		2,754	
3. Saigon Port (Southern Corridor)–Dawei Port Corridor			
Saigon Port/Vung Tau	Moc Bai (BCP)	80	N1, NH22
Bavet (BCP)	Phnom Penh (Cambodia)	158	RN1
Phnom Penh	Poipet (BCP)	365	RN5
Aranyaprathet (BCP)	Bangkok (Thailand)	324	NH33, NH314, N 7,4
Bangkok	Bank Yai	10	Urban roads
Bank Yai	Kanchanaburi	95	Expressway
Kanchanaburi	Phu Nam Ron (BCP)	80	Planned new road
Phu Nam Ron	Dawei (Myanmar)	132	Planned new road
Total		1,244	
4. Saigon Port (South Coastal Corridor)–Dawei Port Corridor			
Saigon Port/HCMC	Rach Gia (Viet Nam)	192	N1, NH63,61, NH80
Rach Gia	Ha Tien (BCP)	105	NH80
Preak Chak (BCP)	Kampot (Cambodia)	39	NH 33
Kampot	Cham Yeam (BCP)	210	RN3, RN4, NH48
Hat Lek (BCP)	Chantaburi (Thailand)	154	N3

Chantaburi	Bangkok	218	N3
Ban Yai (Bangkok)	Kanchanaburi	95	Expressway
Kanchanaburi	Phu Nam Ron (BCP)	80	Planned new road
Phu Nam Ron	Dawei (Myanmar)	132	Planned new road
Total		1,225	
5. Kaladan Corridor to India			
Sittwe Port (Myanmar)	Paletwa	158	By inland waterway or road
Paletwa	Kaletwa (BCP)	129	New road
Total		287	
6. Ha Noi/Hai Phong–India Corridor (Luang Prabang, Vinh)			
Hai Phong	Ha Noi	102	
Ha Noi	Vinh	85	RN1-A, AH1
Vinh	Ky Su (BCP)	175	QL7
Nong Het (BCP)	Luang Phrabang (Lao PDR)	310	N7,12,4
Luang Phrabang	Natuei	220	N13, 2C
Natuei	Ban Houxay (BCP)	170	N3
Chiang Khong (BCP Thailand)	Mae Sai (BCP Thailand–Myanmar)	90	1020,1129,1041, N1
Tachilek (BCP Myanmar)	Meiktila (Myanmar)	500	NH4
Mektila	Mandalay	150	Expressway 2
Mandalay	Monya	130	NH 7
Monywa	Yagyi	62	71
Yagyi	Kalewa	92	71
Kalewa	Tamu (BCP)	211	NH 39
Total		2,297	
7. Ha Noi/Hai Phong–India Corridor (Dien Bien Phu)			
Hai Phong	Ha Noi	102	Expressway
Ha Noi	Dien Bien Phu	309	Ah 13 QL6
Dien Bien Phu	BCP Lao PDR	30	Ah 13
BCP Lao PDR	Namxai	138	N 2E
Namxai	Natuei	65	N 13
Natuei	Ban Houxay (BCP)	170	N3
Chiang Khong (BCP Thailand)	Mae Sai (BCP Thailand–Myanmar)	90	1020,1129,1041, N1
Tachilek (BCP Myanmar)	Meiktila (Myanmar)	500	NH4
Mektila	Mandalay	150	Expressway 2
Mandalay	Monya	130	NH 7
Monywa	Yagyi	62	71
Yagyi	Kalewa	92	71
Kalewa	Tamu (BCP)	211	NH 39
Total		2,049	

BCP = border crossing point, HCMC = Ho Chi Minh City, Lao PDR = Lao People's Democratic Republic.

Source: Author's estimates.

2.2 South Asia–Southeast Asia Rail Corridors

The situation for rail corridors is quite different from that of road corridors. Firstly, there is currently no rail connectivity between South Asia and Southeast Asia. Secondly, there is also not yet connectivity within the GMS and only limited connectivity within South Asia. There are, however, plans to construct missing links within the GMS and South Asia and also to connect the two regions. The rail corridors described below are based on these plans. It should be noted that providing full rail connectivity would be very costly and no reliable time schedule for implementation is available as yet.[7] International development

[7] ASEAN and the GMS are optimistically talking of 2017 for the completion of the Singapore–Kunming Rail Line (SKRL), which would have a direct impact on future South Asia–Southeast Asia rail connectivity.

partners have studied the matter, but no financial commitments have yet been secured as doubts about the economic sustainability persist.

2.2.1 South Asia Rail Corridors

There are two types of missing rail links in South Asia: (i) remaining completion of the rail network in the SASEC region and (ii) connection of SASEC with the GMS through Myanmar.

Completing the rail network means first building short spur rail lines to connect both Nepal BCPs (Bairahawa and Biratnagar) and Phuentsholing BCP in Bhutan to the Indian railway. Second, it means connecting the currently unconnected Manipur and Mizoram capitals in Northeast India. These connections are assumed to be implemented and therefore the four possible corridors are described below (Table 3).

Table 3: Possible Rail Corridors Connecting to Southeast Asia

Origin	**Destination**	**Distance** (kilometers)	**Railway**
1. Assam–Manipur Corridor			
Kolkata	Siliguri	575	West Bengal Railway
Siliguri (West Bengal, India)	Kolkajhar (Assam)	220	NFR (broad gauge)
Kolhajar	Dispur (Guwahati)	200	NFR (broad gauge)
Dispur	Lumding	180	NFR (broad gauge)
Lumding	Katigara (Silchar)	140	NFR (meter gauge)
Katigara	Jiripam (Imphal, Manipur)	70	NFR (meter gauge)
Jiripam	Moreh (BCP Myanmar)	118	New line
Total		1,503	
2. Assam–Mizoram Corridor			
Kolkata	Siliguri	575	West Bengal Railway
Siliguri (West Bengal, India)	Kolkajhar (Assam)	220	NFR (broad gauge)
Kolhajar	Dispur (Guwahati)	200	NFR (broad gauge)
Dispur	Lumding	180	NFR (broad gauge)
Lumding	Katigara (Silchar)	140	NFR (meter gauge)
Katigara	Kolashib (Mizoram)	90	NFR (meter gauge)
Kolashib	Darlon (BCP Myanmar)	148	New line
Total		1,553	
3. *Kolkata–Dhaka–Myanmar Corridor*			
Kolkata	Darshana (BCP Bangladesh)	114	IR (broad gauge)
Darshana	Dhaka	245	BR (broad gauge)
Dhaka	Akhaura	124	BR (meter gauge)
Akhaura	Agartala (Tripura, India)	15	New line
Agartala	Manu	82	NFR meter gauge
Manu	Katigara (Assam)	130	NFR meter gauge
Katigara	Jiripam (Manipur)	70	NFR (meter gauge)
Jiripam	Moreh (BCP Myanmar)	118	New line
Total		898	
4. *Chittagong Rail Corridor*			
Chittagong	Akhaura	210	BR (meter gauge)
Akhaura	Agartala	15	BR (meter gauge)
Agartala	Manu	82	NFR (meter gauge)
Manu	Katigara (Assam)	130	NFR (meter gauge)
Katigara	Jiripam (Imphal, Manipur)	70	NFR (meter gauge)
Jiripam	Moreh (BCP Myanmar)	118	New line
Total		625	

BCP = border crossing point, BR = Bangladesh Railway, IR = Indian Railways, NFR = Northeast Frontier Railway.

Source: Author's estimates

The two first corridors start from Kolkata. The rail distance from Kolkata to Siliguri is 575 km. Therefore, Kolkata–Moreh by rail through the Chicken's Neck is 1,503 km, compared to 898 km if transiting through Bangladesh. Chittagong is well placed to serve Northeast Indian states and even part of Myanmar, as shown by corridor 4 of Table 3, with Chittagong–Myanmar being only 625 km.

The rail corridors in South Asia are still a mix of meter and broad gauge rail tracks. However, Indian Railways is actively converting all the meter gauge tracks in the Northeast Frontier Railway (NFR) into broad gauge. Before connecting to Southeast Asia, Indian Railways' priorities are to provide rail access to all Indian state capitals, including Imphal in Manipur and Aizwal in Mizoram.

2.2.2 Southeast Asia Rail Corridors

In the GMS, the national railways operate in a disjointed way. Railway integration has been, for a long time, a constant unfulfilled objective of ASEAN under the Singapore–Kunming Rail Line (SKRL). Any rail connection between South Asia and Southeast Asia would require first that Southeast Asian rail networks be connected.

There are many missing rail lines in the mountainous terrain of the region, and construction would be expensive and may raise environmental issues. Also, as freight traffic has been on a declining trend, any major new rail investment would be difficult to justify economically. For these reasons, only a few rail corridors could be envisaged to constitute a link between South Asia and Southeast Asia through Myanmar. The only logical rail corridors would then be through first crossing Thailand to Myanmar at the Three Pagodas Pass and second through Yunnan Province.

It should be recalled that one of the aims of the Indian "Look East" policy was to reach dynamic Southeast Asian ports, namely Bangkok/Laem Chabang, Ho Chi Minh City, and Ha Noi (Hai Phong).

The Asian Development Bank (ADB) reviewed the alternatives under the SKRL and proposed four alternatives (ADB 2010):

- Alternative 1 (Cambodia–Viet Nam corridor): This was the route considered and selected originally by ASEAN, requiring connection from Phnom Penh to Loc Ninth (Viet Nam) and then to Ho Chi Minh City. The overall updated cost of constructing the two missing links was estimated at $1.1 billion.
- Alternative 2 (Yunnan Province–Lao PDR corridor): This is the PRC proposal to connect Yunnan Province to Vientiane. ADB (2010) estimates a cost of $5.3 billion, with the current figure quoted by the Lao PDR being $7 billion.
- Alternative 3 (Vientiane–Vung Ang [Viet Nam] corridor): This would be along alignment of RN 8 in the Lao PDR with the estimated cost being $2.3 billion.
- Alternative 4 (North Thailand–Lao PDR–Yunnan Province corridor): This would need extensive new rail construction with an estimated cost of $6.3 billion.

From the South Asia–Southeast Asia connectivity perspective only, alternatives 1 and 3 are attractive and have inspired the design of corridors. A total of five possible rail corridors offering links with South Asia are outlined below (Table 4). To reach South Asia from Hai Phong, three corridors were reviewed: (i) through Vientiane, (ii) through Savannakhet, and (iii) through Yunnan Province. The Savannakhet option is the longest one and the Yunnan option is more than 1,100 km shorter than any route through the Lao PDR and Thailand.

Table 4: Possible Rail Corridors Connecting to South Asia

Origin	Destination	Distance (kilometers)	Railway
1. Saigon Port–India Corridor			
Ho Chi Minh City (Viet Nam)	Loc Ninh	129	New line
Loc Ninh (Viet Nam)	Phnom Penh (Cambodia)	254	New line
Phnom Penh	Poipet (BCP)	386	Cambodia North Line
Aranyaprathet (BCP)	Bangkok	260	
Bangkok	Nak Tok (Thailand)	208	
Nak Tok	BCP Myanmar (Three Pagodas Pass)	153	New line
BCP Myanmar	Thanbyuzayat	110	New line
Thanbyuzayat	Malawmyne	170	
Malawmyne	Bago	215	
Bago	Mandalay	615	
Mandalay	Kalay	539	
Kalay	Tamu	127	New line
Total		3,166	
2. Ha Noi/Hai Phong–India Corridor (Vientiane)			
Hai Phong (Viet Nam)	Ha Noi	102	
Ha Noi	Vinh	319	
Vinh	BCP Lao PDR	70	New line
BCP Lao PDR	Vientiane	480	New line
Vientiane	Nong Khai	13	
Nong Khai	Bangkok	621	
Bangkok	Nak Tok (Thailand)	208	
Nak Tok	BCP Myanmar (Three Pagodas Pass)	153	New line
BCP Myanmar	Thanbyuzayat	110	New line
Thanbyuzayat	Mawlamyne	170	
Mawlamyne	Bago	215	
Bago	Mandalay	615	
Mandalay	Kalay	539	
Kalay	Tamu	127	New line
Total		3,742	
3. Ha Noi/Hai Phong–India (Savannakhet)			
Hai Phong (Viet Nam)	Ha Noi	102	
Ha Noi	Dong Hoa	590	
Dong Hoa	Lao Bao (BCP Lao PDR)	80	New line
Lao Bao	Savannakhet	220	New line
Savannakhet	Mukdahan	15	New line
Mukdahan	Khon Khaen	320	New line
Khon Kaen	Bangkok	450	
Bangkok	Nak Tok (Thailand)	208	
Nam Tok	BCP Myanmar (Three Pagodas Pass)	153	New line
BCP Myanmar	Thanbyuzayat	110	New line
Thanbyuzayat	Mawlamyne	170	
Mawlamyne	Bago	215	
Bago	Mandalay	615	
Mandalay	Kalay	539	
Kalay	Tamu	127	New line
Total		3,914	
4. *Ha Noi–India (through Yunnan Province) Corridor*			
Hai Phong	Ha Noi	102	
Ha Noi	Lao Cai (BCP Yunnan Province)	260	
Lao Cai	Kunming	480	
Kunming	Dali	359	

Dali	Ruili (BCP Myanmar)	350	Under construction
Muse (BCP)	Lashio	142	New line
Lashio	Mandalay	262	
Mandalay	Kalay	539	
Kalay	Tamu	127	New line
Total		2,621	
5. Saigon Port–Dawei Port			
Ho Chi Minh (Viet Nam)	Loc Ninh	129	New line
Loc Ninh (Viet Nam)	Phnom Penh (Cambodia)	254	New line
Phnom Penh	Poipet (BCP)	386	Cambodia North Line
Aranyaprathet (BCP)	Bangkok	260	
Bangkok	Nak Tok (Thailand)	208	
Nam Tok	BCP Thailand–Myanmar	30	New line
BCP Myanmar	Dawei Port	130	
Total		1,397	

BCP = border crossing point, Lao PDR = Lao People's Democratic Republic.

Note: There are two possible links between Thailand and Myanmar: one through the Three Pagodas Pass and a shorter route to Dawei Port.

Source: Author's estimates.

3. PRIORITIZATION OF TRANSPORT CORRIDORS

As mentioned before, there is already a road connecting Myanmar, South Asia, and Southeast Asia, but traveling along that route may be very difficult, slow, and even in cases impossible during monsoons. The purpose of defining transport corridors is to identify routes where, with improvements, seamless travel for goods and passengers can be achieved.

All corridors over time can become seamless transport corridors. However, to make them effective and efficient requires a vast series of road and railroad improvements at a cost of several billion dollars. In this context, it is important to prioritize the corridors in order to channel financial resources in an optimum way. Prioritization uses a set of criteria based on cost and benefit concepts.

3.1 Road Sector

3.1.1 Cost Criteria

The net transport cost of a 20-foot container (or a 15-ton loaded truck) would be the ideal cost criterion. Where this is not available, the following criteria can be used as proxies for cost:

- the total distance (in kilometers) from gateway port to gateway port, since fuel consumption and delivery time vary with distance;
- the number of BCPs crossed, since these impose delays, costs, and often transshipments;
- the overall quality of road infrastructure, as poor or congested roads increase vehicle operating costs;
- the level of security, as this has an impact on transport costs (due to delays, the need to travel in convoys, and the risk of high jacking) and benefits (missed trade opportunities). This refers to the presence of insurgency in Northeast Indian states and in Myanmar;
- the volume of resettlement and land acquisition problems, as these affect construction costs and cause delays in implementation; and

- the overall cost of road improvements, as this reflects the importance of budget constraints.[8]

3.1.2 Benefit Criteria

Seamless transport corridors would generate microeconomic and macroeconomic benefits, which could be measured using the following criteria:

- Savings in road user costs from a reduction in vehicle operating costs and time savings. These estimates are not likely to be readily available, so qualitative estimates would have to be used.
- At the macro level, economic benefits would be in terms of increases in trade volume and induced economic activity along the corridor.
- Additional economic benefits would be the generation of passenger movement and increases in tourism.

Scoring and ranking of corridors is always a difficult task and arbitrariness is hard to avoid. A simple methodology was adopted with scores per variable varying between –3 and +3.[9] The range of possible total scores then varies from –12 to +12. In order to get an equal balance between costs and benefits, benefits were given a higher weight (2 instead of 1). Details are summarized in Table 5.

[8] The total improvement cost is the sum of all the costs of the required projects along the corridor. Projects are described in detail in the following section.

[9] For quantitative estimates, scores were assigned according to statistical distribution around the mean value. For non-quantitative criteria, scores are the author's estimates based on information from ADB reports and recent BIMSTEC reports. No attempt was made to give weights to the criteria. What matters here is the relative value of the total scores more than the absolute values.

Table 5: Criteria for Corridor Evaluation

Indicator	Objective	Scoring	Weight
1. Distance (total distance in kilometers)	Distance is a good proxy for transport and trade cost.	Scoring varies between –1 and –3. Values around the mean get –2; distances lower than the mean, –1; and greater than the mean, –3.	1
2. Improvement cost ($ million)	High construction costs associated with new project construction make corridors less attractive.	Same methodology as distance, with scores varying from –1 to –3.	1
3. Number of BCPs along the corridor	The number of BCPs is correlated with delays and trade costs.	Same methodology as above. With 4 BCPs, –1; 5 BCPs, –2; and 6 BCPs, –3.	1
4. Overall road quality	Road conditions are highly correlated with transport costs.	Scores are estimates based on GMS and BIMSTEC documents; scores from –1 to –3.	1
5. Security risk	Corridors passing through "insecure" zones are less attractive.	Scores vary from 0 to –3, according to the perception of the degree of insecurity.	1
6. Resettlement and land acquisition	This could be a major cause of delays in implementation.	Scores vary from 0 to –3 according to the perception of the degree of problem.	1
7. Road user savings	This variable is to assess the direct benefits of infrastructure improvements to road users.	Scores vary from +1 to +3 depending on expectations of traffic increases	2
8. Trade and economic prospects	This is a qualitative assessment of the capacity of the corridor to contribute to trade and economic growth.	Scores vary from 0 to +3 according to the perception of the degree of success of the corridor.	2
9. Passenger and tourism flows	This is a qualitative assessment of the capacity of the corridor to contribute to increases in flows of passengers and tourists.	Scores vary from 0 to +3 according to the perception of the degree of success of the corridor.	2

BCP = border crossing point, BIMSTEC = Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation , GMS = Greater Mekong Subregion.

Source: Author's compilation.

A total of eight road corridors were analyzed, with five of them originating from Kolkata, two from Chittagong, and one multimodal corridor (connecting Chennai Port, Dawei, and Saigon Port). Destination ports were either Hai Phong or Saigon Port, and in South Asia routes were either through the Chicken's Neck or through Bangladesh. The Kaladan Corridor was not evaluated as it cannot be classed as a South Asia–Southeast Asia corridor.

The results are presented in Table 6. The three highest scorers are the Kolkata–Saigon Port Corridor through the Chicken's Neck (+4), the Chittagong–Saigon Port Corridor (+2), and the Chennai–Dawei–Saigon Port Corridor (+3). The Chennai–Dawei–Saigon Port Corridor does not compete with the other corridors and meets different connectivity objectives.

The two Kolkata–Hai Phong corridors and the Chittagong–Hai Phong Corridor scored lower (–3, –5, and –5, respectively). These corridors require extensive road rehabilitation and road construction in the difficult mountainous terrain in Myanmar and the Lao PDR. Traffic and economic development was expected to be less than on the Kolkata–Saigon Port Corridor. Road corridors through Bangladesh bring significant reductions in distance and required

investment; however, difficulties with border crossings and congestion on national roads outweigh the distance advantages.

Road conditions were generally good in Southeast Asian corridors, but this was not the case for South Asian corridors. Only 16% of the planned improvements between Kolkata (Barasat) and Siliguri have been completed with 19% estimated for the Assam highway between Siliguri and Moreh. It has been estimated that only 50% of the planned investment would be completed by 2017.[10]

3.2 Railway Sector

Railway operations are facing a series of serious challenges both in South Asia and Southeast Asia: decreasing freight and passenger traffic, poorly maintained rail tracks, rolling stock needing replacement, and chronic budget deficits taxing scarce government resources. There is little or no connectivity among the Southeast Asian railway networks with the exception of the Thailand–Malaysia link, and poor connectivity in South Asia. Establishing regional connectivity would turn out to be an expensive proposition. When national railway operators are fighting to survive, it is not surprising that connectivity matters have so far received low priority.

The situation varies by country. In India, the railway has managed to keep its importance for freight and passenger services, comprising 30% and 20% of the total traffic, respectively, but shares are decreasing. In Bangladesh, railways represent only 7% of freight and passenger traffic. The situation is not any better in Thailand and Viet Nam, where shares are 5% and 2%, respectively, for freight traffic, and 2% and 6.5% for passenger traffic. In Myanmar, though recent numbers are not available, the share is estimated to be 30% for freight and passenger traffic.

As in the case of roads, rail corridors can be prioritized using cost and benefit criteria.

Costs

- The overall distance of the corridors remains an important proxy for transport cost.
- There are many missing rail links along the corridors, and filling the gaps in the railway network is very expensive and could constitute a serious burden on the public budget. Private participation in financing is unlikely to happen.
- For railway connectivity, changes in rail gauges and mandatory transshipments are a more serious constraint than problems associated with border crossing.
- Seamless transportation along the corridors would depend on the quality of the railway services and their operational efficiency.
- Security is less of an issue for railway corridors than for road corridors, but resettlement and land acquisition associated with the construction of new links could constitute serious obstacles.

Benefits

- Qualitative estimates of the savings in operating costs would be the first benefits to consider, as in the case of roads.
- Qualitative estimates of trade increases and trade prospects should be the second major type of benefit.
- Some railway operations are converting themselves into being predominantly

[10] Information on road conditions in India and Myanmar comes from the BIMSTEC Draft Report Phase I "Updating and Enhancement of the Transport Infrastructure and Logistics Study."

passenger services. Therefore, contribution to offering better passenger and tourism services should be an important benefit.

A total of five rail corridors, all originating from Kolkata, were analyzed. There are many ways to reach Hai Phong from South Asia and three possible corridors were considered. Reaching Saigon Port in Ho Chi Minh City requires traveling through the Chicken's Neck or through Bangladesh.

The scoring methodology is identical to the one used above for the roads with scores per variable ranging from –3 to +3 and total scores varying from –12 to +12. The results are presented in Table 7. None of the corridors had high scores. The Dawei–Saigon Port Corridor had the highest score (+3) though it is not a full through corridor. Marginal results were obtained for the Kolkata–Hai Phong Corridor through Yunnan Province in the PRC (+1) and the Kolkata–Saigon Port Corridor through the Chicken's Neck (+1). Other corridors fared badly because of the number of missing links.

3.3 The Selected Road and Rail Corridors

Finally, which road and rail corridors should be retained in order to evaluate and prioritize the transport cross-border investments? For road corridors, the Kolkata–Saigon Port Corridor through the Chicken's Neck and the Chittagong–Saigon Port Corridor had relatively good scores. The Chittagong–Saigon Port score could be explained because of its short distance and low improvement costs, since it does not require the expensive cost of making the Chicken's Neck Corridor attractive and less congested. But as trade and supply chains are concerned, Kolkata with its manufacturing production centers definitely has more to offer. The preference here is then given to the Kolkata–Saigon Port Corridor through the Chicken's Neck. The Dawei–Saigon Port road corridor has a high score but it can be considered as part of the South Asia–Southeast Asia Connectivity Corridor only when the sea segment between Dawei and Chennai is added.

The results are different for the railway corridors. Missing links for road corridors refer to poor roads, which cannot offer connectivity through all seasons. Missing links for railways mean the absence of rail tracks. The railways in the GMS have all reached a turning point. They would have to decide whether it is worthwhile to carry out massive investments to modernize their services and achieve competitiveness, and whether they should favor a passenger or freight service. In any case, South Asia–Southeast Asia connectivity would probably not be their priority for the next 10 years.

However there could be exceptions. First, connecting South Asia to Hai Phong in Viet Nam through Yunnan Province presents attractive advantages. The railway infrastructure in Yunnan Province is either complete or under completion. Therefore building the missing link, Lashio–Ruili, from Myanmar to Yunnan Province presents clear advantages. The focus of this paper is not on South Asia–PRC connectivity, and therefore this corridor has less importance even if the Lashio–Ruili missing link in Myanmar is constructed before the other missing links. Also, providing that Dawei Port becomes a reality, building a rail connection to the future port could be considered. This connection would be cheaper and easier to construct than the Three Pagodas Pass rail link between Thailand and Myanmar, and could in fact be considered as a suitable alternative.

The road and rail corridor evaluations are presented in Tables 6 and 7.

Table 6: Road Corridor Evaluation

Road Corridor	Distance (kilometers)	Improvement Cost ($ million)	Number of BCPs	Overall Road Quality	Security Risk	Resettlement Land Acquisition	Road User Savings	Trade and Economic Prospects	Tourism Passenger Volumes	Total
Kolkata–Hai Phong (Chicken's Neck)	3,767 Score: -2	2,827 (Dien Bien Phu; minimal cost in the Lao PDR and Viet Nam) Score: -3	4 BCPs Score: -1	Assam road not completed; major rehabilitation needed in the Lao PDR Score: -3	High risk in NE India and Myanmar Score: -3	Problems in NE India; unknown elsewhere Score: -3	High traffic and investment levels Score: 3	Not major trade route Score: 1	Relatively good prospects Score: 2	-3
Kolkata–Hai Phong (Bangladesh)	3,402 Score: -1	1,397 (no road improvement in Bangladesh) Score: -1	6 BCPs Score: -3	Same (above) congestion in Bangladesh Score: -3	High risk in NE India and Myanmar Score: -3	Problems, less than above Score: -2	High traffic and investment Ban congestion Score: 2	Not major trade route Score: 1	Mixed prospects Score: 1	-5
Kolkata–Saigon Port (Chicken's Neck)	4,430 Score: -3	2,981 (Assam improvements) Score: -3	4 BCPs Score: -1	Assam road not completed Score: -2	High risk in NE India and Myanmar Score: -2	Problems in NE India; unknown elsewhere Score: -3	High traffic and investment levels Score: 3	Prospects for trade and economic activities Score: 3	Good prospects Score: 3	+4
Kolkata–Saigon Port (Bangladesh)	3,875 Score: -2	1,445 (no road improvement in Bangladesh) Score: -1	6 BCPs Score: -3	Same (above) congestion in Bangladesh Score: -2	High risk in NE India and Myanmar Score: -2	Problems, less than above Score: -2	High traffic and investment Ban congestion Score: 2	Prospects for trade and economic activities Score: 3	Relatively good prospects Score: 2	+2
Kolkata–Da Nang (EWEC)	4,278 Score: -3	2,971 (no road improvement in the Lao PDR or Viet Nam) Score: -3	4 BCPs Score: -1	Assam road not completed Score: -2	High risk in NE India and Myanmar Score: -2	Problems in NE India; unknown elsewhere Score: -3	Less traffic on EWEC Score: 2	Mixed prospects for trade and economic activities Score: 2	Relatively good prospects Score: 2	-5
Chittagong–Hai Phong	3,049 Score: -1	2,657 (Dien Bien Phu; minimal cost in the Lao PDR and Viet Nam) Score: -3	5 BCPs Score: -2	Major rehabilitation in Myanmar and the Lao PDR Score: -2	High risk in NE India and Myanmar Score: -3	Problems, less than above Score: -2	High traffic and investment Ban congestion Score: 2	Not major trade route Score: 1	Mixed prospects Score: 1	-5
Chittagong–Saigon Port	3,288 Score: -1	2,885 Score: -3	5 BCPs Score: -2	Rehabilitation only in Myanmar Score: -1	High risk in NE India and Myanmar Score: -2	Minor problems Score: -1	High traffic and investment Ban congestion Score: 2	Mixed prospects for trade and economic activities Score: 2	Relatively good prospects Score: 2	+2
Chennai–Saigon Port (through Dawei Port)	3,214 Score: -1	1,510 (no Chennai and Kanchanaburi–Bang Yai cost) Score: -1	5 BCPs Score: -2	Few road links missing Score: -1	Minimal risk Score: -1	Minor problems Score: -1	Unknown traffic volume prospects Score: 1	Prospects for trade and economic activities Score: 3	Mixed prospects Score: 1	+3

BCP = border crossing point, EWEC = East–West Economic Corridor, km = kilometer, Lao PDR = Lao People's Democratic Republic, NE = Northeast.

Source: Author's compilation.

Table 7: Rail Corridor Evaluation

Rail Corridor	Distance (kilometers)	Improvement Cost ($ million)	Number of BCPs/Gauge Changes	Missing Links	Operations and Operability Efficiency	Resettlement Land Acquisition	Freight Traffic Benefits	Trade and Economic Prospects	Tourism Passenger Volumes	Total
Kolkata–Hai Phong (through Vientiane, Lao PDR)	5,318 (1,578 in SA, 3,742 in SEA) Score: -3	4,120 Score: -2	BCPs: 4 Gauge changes: 1 Score: -1	1,699 Score: -2	Low Score: -3	Problems in the Lao PDR Score: -2	Low Score: 1	Some prospects Score: 2	Medium to low Score: 2	-3
Kolkata–Hai Phong (through Savannakhet, Lao PDR)	5,492 (1,578 in SA, 3,914 in SEA) Score: -3	5,105 Score: -3	BCPs: 4 Gauge changes: 1 Score: -1	1,784 Score: -2	Low Score: -3	Problems in Thailand and Viet Nam Score: -3	Low Score: 1	Low Score:1	Medium to low Score: 2	-7
Kolkata–Hai Phong (through Yunnan Province)	4,199 (1,578 in SA, 2,621 in SEA) Score: -1	1,809 Score: -1	BCPs: 3 Gauge changes: 3 Score: -3	1,288 Score: -1	Medium Score: -2	Possible problems in Myanmar Score: -1	Medium Score: 2	Some prospects Score: 2	Low Score: 1	+1
Kolkata–Saigon Port (through Chicken's Neck and Cambodia)	4,536 (1,578 in SA, 2,958 in SEA) Score: -2	4,110 Score: -2	BCPs: 4 Gauge changes: 1 Score: -1	2,178 Score: -3	Low Score: -3	Possible problems in Viet Nam Score: -2	Medium Score: 2	Some prospects Score: 2	Medium Score: 3	+1
Kolkata–Saigon Port (through Bangladesh and Cambodia)	3,856 (898 in SA, 2,958 in SEA) Score: -1	4,125 Score: -2	BCPs: 6 Gauge changes: 3 Score: -3	2,188 Score: -3	Low Score: -3	Possible problems in Viet Nam Score: -2	Medium Score: 2	Some prospects Score: 2	Medium Score: 3	0
Saigon Port–Dawei	1,397 Score: -1	2,515 Score: -1	BCPs: 3 Gauge changes: 0 Score: -1	1,189 Score: -1	Low Score: -3	Possible problems in Viet Nam Score: -2	Medium Score: 2	Higher prospects Score: 3	Low Score: 1	+3

BCP = border crossing point, Lao PDR = Lao People's Democratic Republic, SA = South Asia, SEA = Southeast Asia.

Source: Author's compilation.

4. TRANSPORT INFRASTRUCTURE PROJECTS: IDENTIFICATION AND PRIORITIZATION

For the corridors described above, potential infrastructure projects that could significantly contribute to improving connectivity between South Asia and Southeast Asia are investigated here. Some projects are more realistic than others and have a better chance of being economically justifiable.

The road and rail projects come from different sources. They are consistent with documents and thinking within ADB's South Asia Department (SARD) and Southeast Asia Department (SERD). The selection, however, was made by the author. Most cost estimates come from ADB documents. When information was missing, the author provided cost estimates based on data from comparable projects. The details on the potential transport infrastructure projects are given in the Appendix.

Before going into a more detailed analysis and screening of the projects, Table 8 gives an overview of the potential projects on all possible corridors.[11]

Table 8: Summary of Cost Estimates of All Potential Road and Rail Projects

Country	**Road Project Distance** (kilometers)	**Road Project Cost** ($ million)	**Rail Project Distance** (kilometers)	**Rail Project Distance**[a] ($ million)
SASEC				
Bangladesh	648	2,564	261	1,604
India	1,623	2,637	511	2,096
Subtotal	2,271	5,201	772	3,700
GMS				
Cambodia	45	85	643	1,275
Lao PDR	1,042	780	704	4,265[b]
Myanmar	1,593	1,534	3,379	1,590
Thailand	569	2,250	824	2,028
Viet Nam	180	410	129	900
Subtotal	3,429	5,059	5,679	10,059
Total	5,700	10,260	6,451	13,759

Lao PDR = Lao People's Democratic Republic, GMS = Greater Mekong Subregion, SASEC = South Asia Subregional Economic Cooperation.

[a] Only new rail projects; rail connections to Yunnan Province, People's Republic of China, not included.

[b] $4,200 million for Savannakhet–Lao Bao BOOT (build–own–operate–transfer) project.

Source: See Appendix.

This long list of potential projects to improve connectivity amounts to 5,700 km of roads for a cost of $10 billion, and 6,400 km of new rail lines for a cost of $13.7 billion. The priority projects were selected from this set of projects based on the criteria and analysis described below.

[11] New roads and new rail line projects were included in the above table including some ongoing projects.

4.1 Prioritization Criteria

The evaluation of transport cross-border investments should normally be the result of cost–benefit analysis. In a few cases, feasibility studies have already been done or are ongoing, but for most cases, these studies would only be conducted in the future. Therefore, qualitative indicators were used to evaluate and rank projects based on the following criteria (see Table 9):

(i) connectivity rationale,

(ii) traffic and trade intensity,

(iii) project recognition and acceptance,

(iv) project preparedness,

(v) socio-environmental problems, and

(vi) extent of benefit sharing among participating countries.

Table 9: Criteria for Project Evaluation

Indicators	Objectives	Scoring	Weight
Connectivity rationale	This is the most important indicator evaluating the degree of contribution to regional connectivity.	• Missing link to border: +4 • Rehabilitation of road/rail to border: +3 • Missing link not to border: +2 • Rehabilitation of road/rail not to border: +1	1.5
Traffic and trade	To be attractive, projects should have current and potential traffic and trade.	• High current and prospective traffic and trade: +4 • Low current and high prospective traffic and trade: +3 • High current and low prospect traffic and trade: +2 • Low current and low prospective traffic and trade: +1	1.0
Project recognition	To be likely to be implemented, projects should be part of the list of National Plans and Priorities.	• Yes listed in National Plans and Priorities and RIF: +2 • Yes mentioned at least in 1 technical assistance project or plan: +1 • Not listed in National Plans and Priorities: 0	2.0
Project preparedness	Ease of implementation would depend on project preparedness, including financing intentions.	• Existing financial service and clear financing intentions: +3 • Ongoing financial service and some financing intentions: +2 • Preliminary work, vague financing intentions: +1 • No work or financing: 0	1.0
Socio-environmental problems	Projects with a high degree of potential socio-environmental problems would be judged as less attractive.[a] Included here are also security issues.	• High problem level: -3 • Medium level: -2 • Low level: -1 • No problem: 0	1.0
Benefit sharing	Projects should bring benefits to connected countries and the degree of benefit sharing is important.	• High level of equal sharing: +3 • Some unequal sharing: +2 • Low sharing: +1 • No sharing: 0	1.0

RIF = Regional Investment Framework.

[a] There could be a long list of socio-environmental problems including resettlement, land acquisition, and environmental degradation problems.

Source: Author's compilation.

The above set of indicators was used for both road and rail projects. Scores were calculated only for the projects related to the selected corridors. The maximum possible score was 21.

Final recommendations for the road and rail sector were based on the analysis of three tables: (i) the road and rail corridors evaluation (see Tables 6 and 7), (ii) the new road or rail projects, and (iii) the scoring of road and rail investment projects.

It should be noted that the main source for the screening of recommended projects on considered corridors is the list provided in the Appendix. Additional information came from draft documents from the ongoing BIMSTEC study, draft country reports under the ADBI study, as well as documents from the Dawei and Kaladan project websites, ADB, and the Government of India.[12]

4.2 Road Project Investments

Table 16 (at the end section 4) presents a list of required new projects with information on distance and cost for six corridors.[13] As indicated above, only the Kolkata–Saigon Port and Saigon Port–Dawei corridors were assessed to be priority corridors; information on other corridors is useful for comparison. Project information comes from GMS Regional Investment Framework (RIF), BIMSTEC, and other ADB sources. No road improvements are allocated to Bangladesh, Cambodia (except for the Poipet BCP), and Viet Nam, as no specific projects have been reported. In these countries, the road is paved along the corridor route, but widening and rehabilitation might be needed in the long term.

For the Kolkata–Saigon Port Corridor through the Chicken's Neck, the full cost of rehabilitating the Northeast Indian corridor is $1.9 billion, which alone accounts for two-thirds of the total corridor project cost. Most of the contracts along that route have already been allocated, but less than 20% have been completed and it is expected that only 50% will be completed by 2017. If that cost were to be removed, arguing that rehabilitation is already ongoing, then the net cost for the Kolkata–Saigon Port Corridor would be only $1.1 billion for an overall distance of 4,430 km. Total project costs on all corridors are of the same order of magnitude; the exception is the Kolkata–Saigon Port Corridor through Bangladesh, since no road improvement in Bangladesh is included.

Table 17 (at the end section 4) gives the scoring of new road projects only. Ongoing and purely national projects have not been considered. All the selected projects have scores above the computed mean. This suggests that over a certain period of time, all projects would be worth implementing through a series of investment waves. The first wave of investment projects ($500 million) would be for the high scorers as presented in Table 10.

[12] See Dawei (http://daweidevelopment.com) and Kaladan (http://www.kaladanmovement.org) projects.

[13] The six corridors are Kolkata–Saigon Port (Chicken's Neck), Kolkata–Saigon Port (Bangladesh), Chittagong–Saigon Port, Kolkata–Da Nang, Kolkata–Hai Phong (Chicken's Neck and the Lao PDR), and Saigon Port–Dawei.

Table 10: Priority Road Investments

Country	Road Project	Distance (kilometers)	Cost ($ million)	Score
India	Imphal–Moreh	95	160	17
Myanmar	Endu–Kawkareik	70	150	18.5
	Kawkareik–Myawaddy	46	37	20
Thailand	Myawaddy–Mae Sot	17	55	19
	Mae Sot–Tak	78	90	17.5
Cambodia	Aranyaprathet–Poipet	10	40	18
Total		316	532	18.5

Source: See Appendix.

All of the six priority projects are either roads connecting to BCPs or improvements to the BCPs. All the above road projects have high scores and are part of the highly ranked and selected Kolkata–Saigon Port Corridor. The rationale for implementing such projects is simple. Roads leading to BCPs are often neglected and not maintained properly. In India, the Imphal–Moreh road is below standard and in poor condition. The same applies to the roads in Myanmar on the other side of the border. The Tamu–Kalewa road was financed and built by India approximately 10 years ago. Bridges were not included in the contract. The road has badly deteriorated and full rehabilitation is now needed, but security concerns may delay implementation. Security is less of a concern for roads from Myanmar leading to Thailand, especially for the one leading to the Mae Sot border; poor maintenance and bridge reconstruction make improvements necessary. In Thailand, road projects along the corridor are to aimed to create a seamless four-lane road network.

Investments on the road corridor would be through a series of waves reflecting different levels of priorities (Tables 11 and 12).

Table 11: Kolkata–Saigon Port (Chicken's Neck) Levels of Road Investments

	Distance (kilometers)	Cost ($ million)	$ million/km
First priority: Highly scored road investments directly contributing to regional connectivity	316	532	1.68
Second priority: New road projects along corridor not listed in first priority	835	578	0.69
Third priority: Completion of the four-lane road investment in Northeast India from Kolkata to Silchar	1,622	1,871	1.15
Total road projects	2,773	2,981	1.07
Overall total	4,430	2,981	

Source: See Appendix.

The full cost of developing the Kolkata–Saigon Port Corridor is $3 billion, but only $1.1 billion without the cost of connecting Kolkata to the Northeast Indian states. It is expected that this construction would take place independently. The corridor provides the optimum route for the volume of trade passing through the Myanmar–Thailand BCP at Myawaddy/Mae Sot.

The Chennai–Dawei–Bangkok–Laem Chabang–Saigon Port Corridor came out with a high score in the evaluation sheet. Details on that corridor are given below.

Table 12: Chennai–Saigon Port Multimodal Investments

	Distance (kilometers)	**Cost** ($ million)	**$ million/km**
First priority: Missing links in Myanmar (Dawei–Phu Nam Ron) and Thailand (Phu Nam Ron–Kanchanaburi)	212	360	1.70
Second priority: Other missing link road projects cost from Dawei to Saigon Port	334	150	0.45
Total land corridor cost from Dawei to Saigon Port	1,149	510	N/A
Full corridor cost Chennai–Saigon Port without cost for Chennai port improvements	3,214	1,510[a]	N/A

[a] Includes $1 billion for Dawei Port and maritime distance from Chennai to Dawei.

Source: See Appendix.

The Chennai–Dawei–Saigon Port Corridor has the potential to be a very successful economic corridor. Turning potential into reality, however, would mean lifting up numerous uncertainties. Thailand has long wished to build a large deep sea port on the Andaman Sea to fulfill its "Look East" policy and receive liquid and dry bulk cargoes. Such interest explains the plans to develop Pak Bara in the south of Thailand as a deep sea port on the Andaman Sea linking it to the Gulf of Thailand through a land bridge. Pak Bara development, however, has faced drawbacks: shallow water in the Andaman Sea, environmental issues, and no immediate hinterland.

Dawei Port is located in South Myanmar but so far it is Thailand that has been behind its development. Dawei is only 300 km away from Bangkok and could therefore provide an interesting option for trade generated from the Bangkok area as well as the eastern seaboard area (imports and exports). The trade would probably—at least in the beginning—be limited to South Asia. Thailand's trade with the rest of Asia, Europe, and the Middle East would continue to be by sea. The situation would be different if the planned industrial park, originally sponsored by Japan, materialized in Dawei. Then production units could be fully integrated into a complex system of supply chains running from Bangalore to Chennai in India and Bangkok, Laem Chabang, and the eastern seaboard in Thailand. Saigon Port is mentioned as the end of the corridor gateway to keep consistency with other corridors. Trade from Viet Nam to South Asia would in the future continue to be by sea, but a vibrant Dawei Port and fast land connections may present advantages for industries located in the Ho Chi Minh City area.

None of the Kolkata–Hai Phong corridors received scores higher than the average, because of the high number of expensive missing links. This does not mean that connectivity would not be established once Myanmar and the Lao PDR complete their missing links. The Kolkata–East–West Economic Corridor did not receive a good score because of relatively low expected economic prospects.

The Kaladan Project connecting Sittwe Port in Myanmar with Mizoram State in India at a cost of $234 million is not included.[14] The project is intended to provide easy sea access to Northeast Indian states, but does not constitute a true South Asia–Southeast Asia route and does not fulfill the original intention of the Look East policy.

[14] The project has four components: (i) Sittwe port expansion, (ii) inland water transport and dredging of the river, (iii) road from Paletwa to the Indian border, and (iv) road in Mizoram from the border. The $234 million only refers to the cost of the two project roads (BIMSTEC 2014, Myanmar).

4.3 Rail Project Investments

Following the same method as for roads, rail projects are first listed by corridors in Table 18, with scores for new projects only in Table 19 (at the end of section 4). As expected, none of the rail corridors fare very well.[15] The two highest scorers are for road investments: the Kolkata–Saigon Port through the Chicken's Neck and the Dawei–Saigon Port with branching to Laem Chabang.[16] There are too many missing links to make the Kolkata–Hai Phong through Lao PDR economically justifiable. The best way to reach Hai Phong from South Asia is through Yunnan Province since rail facilities are in place in the PRC. Along that corridor, projects in Myanmar and Viet Nam have the highest scores. Rail projects by corridors are summarized in Tables 13, 14, and 15.

Table 13: Kolkata–Saigon Port Rail Project Investments

Rail Link	Distance (kilometers)	Cost ($ million)	$ million/km	Score	Project Type
Jiribam–Imphal	125	520	4.16	11.5	New rail line
Imphal–Moreh	95	400	4.21	11.0	New rail line
Tamu–Kalay	127	98	0.77	10.0	New rail line
Kalay–Mandalay	539	162	0.3	9.0	Rehabilitation
Three Pagodas Pass (Myanmar)	110	250	2.27	13.0	New rail line
Three Pagodas Pass (Thailand)	153	490	3.2	12.0	New rail line
Bangkok–Aranyaprathet	260	15	0.06	13.5	Rehabilitation
Poipet–Phnom Penh	386	175	0.45	14.5	Rehabilitation[a]
Phnom Penh–Loc Ninh	254	1,100	4.33	10.0	New rail line
Loc Ninh–Ho Chi Minh City	129	900	6.98	10.0	New rail line
Subtotal	2,178	4,110	1.89	11.4	

[a] Includes 46 kilometers of missing link construction between Cambodia and Thailand.

Source: See Appendix.

Table 14: Kolkata–Hai Phong (Yunnan Province) Rail Projects

Rail Link	Distance (kilometers)	Cost ($ million)	$ million/km	Score	Project Type
Jiribam–Imphal	125	520	4.16	11.5	New rail line
Imphal–Moreh	95	400	4.21	11.0	New rail line
Tamu–Kalay	127	98	0.77	10.0	New rail line
Kalay–Mandalay	539	162	0.3	9.0	Rehabilitation
Lashio–Ruili (Yunnan Province)	142	480	3.38	17.0	New rail line
Ha Noi–Lao Cai (border crossing point)	260	149	0.57	18.5	Rehabilitation
Subtotal	1,288	1,809	1.4	12.3	

Source: See Appendix.

[15] The highest scores vary between 2 and 3, just above the average value of 0 and far from the maximum score of 12.

[16] Bangkok–Laem Chabang by road is 132 km and 140 km by rail. The branching to the rail corridor will only involve the distance between Chachoengsao and Laem Chabang, or 80 km.

Table 15: Dawei–Saigon Port Rail Projects

Rail Link	Distance (kilometers)	Cost ($ million)	$ million/km	Score	Project Type
Dawei–BCP Myanmar	130	325	2.5	12.0	New rail line
BCP–Nam Tok	30	75	2.5	13.0	New rail line
Bangkok–Aranyaprathet	260	15	0.06	13.5	Rehabilitation
Poipet–Phnom Penh	386	175	0.45	14.5	Rehabilitation
Phnom Penh–Loc Ninh	254	1,100	4.33	10.0	New rail line
Loc Ninh–Ho Chi Minh City	129	900	6.98	10.0	New rail line
Subtotal	1,189	2,590	2.18	12.5	

Source: See Appendix.

The weighted average scores for the Kolkata–Hai Phong and Dawei–Saigon Port projects are quite close, being 12.3 and 12.5, respectively.[17] On a cost basis, projects on the Kolkata–Hai Phong link through Yunnan Province are the cheapest to implement. Of course, decisions on implementation would depend on favorable answers from the feasibility studies with traffic forecasts taken into account. The Kolkata–Saigon Port and Kolkata–Hai Phong projects meet the wish of the Government of India to connect Delhi to Viet Nam by rail. By the same token they would also fulfill the objective of ASEAN to connect Kunming to Singapore (SKRL).

There have been doubts expressed on the viability of building a rail line through the Three Pagodas Pass, but alternatives exists. A rail line from Nam Tok in Thailand to Dawei in Myanmar may be technically and economically more feasible. All rail projects on the above three corridors are recommended to be eventually implemented when proven economically justifiable. However, such implementation is not for the immediate future. If feasibility studies were carried out now, all projects would likely fail to be economically justifiable accounting for the poor performance of the different national railways. It is only when national railways become profitable and increase their share of freight transport that constructing missing links for regional purposes can be seriously envisaged.

[17] Scores were weighted according to distance.

Table 16: New Road Projects in Main Corridors

	Kolkata–Saigon Port (Chicken's Neck)		Kolkata–Saigon Port (Bangladesh)		Chittagong–Saigon Port (Bangladesh)		Kolkata–Da Nang (Lao PDR)		Kolkata–Hai Phong (Chicken's Neck)		Saigon Port–Dawei Port	
	(km)	($ million)	(km)	($ million)	(km)	($ million)	(km)	($ million)	(km)	($ million)	(km)	($ million)
Kolkata–Dalkhola	430	743					430	743	430	743		
Dalkhola–Siliguri	130	64					130	64	130	64		
Siliguri–Guwahati	485	424					485	424	485	424		
Guwahati–Nagaon	128	180					128	180	128	180		
Nagaon Silchar	289	300					289	300	289	300		
Silchar–Imphal	160	160	160	160	160	160	160	160	160	160		
Imphal–Moreh (BCP Myanmar)	95	160	95	160	95	160	95	160	95	160		
Tamu–Kalewa	160	245	160	245	160	245	160	245	160	245		
Kalewa–Monya	186	95	186	95	186	95	186	95	186	95		
Monya–Mandalay	99	0	99	0	99	0	99	0	99	0		
Mandalay–Bago	522	0	522	0	522	0	522	0				
Bago–Payagi	20	0	20	0	20	0	20	0				
Payagi/Thaton–Endu	151	128	151	128	151	128	151	128				
Endu–Kawkareik	70	150	70	150	70	150	70	150				
Kawkareik–Myawaddy (BCP Thailand)	60	37	60	37	60	37	60	37				
Myawaddy–Mae Sot	17	55	17	55	17	55	17	55				
Dawei–Phu Nam Ron (BCP)		0					0	0			132	200
BCP–Kanchanaburi		0					0	0			80	160
Mae Sot–Tak	78	90	78	90	78	90	78	90				
Tak Bangkok	423	0	423	0	423	0						
Bangkok–Aranyaprathet	324	110	324	110	324	110					324	110
Aranyaprathet–Poipet (BCP Cambodia)	19	40	19	40	19	40					19	40
Poipet–Phnom Penh	365	0	365	0	365	0					365	0
Phnom Penh–Bavet/Moc Bai (BCP Viet Nam)	158	0	158	0	158	0					158	0
Moc Bai–Saigon Port	80	0	80	0	80	0					80	0
Kolkata–Petrapole/Benapole (BCP Bangladesh)			80	160								

Benapole			0	20					0			
Benapole–Dhaka			355	0								
Dhaka–Agartala (BCP Tripura India)			155	0								
Agartala–Silchar			267	15	267	15						
Chittagong–Dhaka					245	1600						
Dhaka–Agartala (BCP Tripura India)					155							
Tak–Khon Khaen							495					
Khon Khaen–Savannakhet							210	140				
Savannakhet–Lao Bao							253					
Lao Bao–Dong Ha							80					
Dong Ha–Da Nang							170					
Ha Noi–Hai Phong									102			
Ha Noi–Dien Bien Phu									309			
Dien Bien Phu–BCP									30			
BCP (Lao PDR)–Namxai									138	90		
Namxai–Natuei									65			
Natuei–Ban Houxay (BCP)									170			
Chiang Khong (Thailand)–Mae Sai (BCP Myanmar)									1			
Tachilek–Monglar									70			
Monglar–Keng Tung									70	93		
Keng Tung–Loilem									270	359		
Loilem–Meiktila									230			
Meiktila–Mandalay									150			
Total	4,439	2,981	3,844	1,465	3,307	2,885	4,288	2,971	3,767	2,827	1,158	510

BCP = border crossing point, km = kilometer, Lao PDR = Lao People's Democratic Republic.

Sources: Regional Investment Framework 2013 in ADB (2013); ADB–SASEC (2013); Government of India (2012); BIMSTEC (2014); author estimates.

Table 17: Scoring of Road Investment Projects

	Distance (km)	**Cost** ($ million)	**Connectivity**	**Traffic**	**Project Recognition**	**Project Preparedness**	**Socio-Environmental**	**Benefit Sharing**	**Total**
Weight			1.5	1.0	2.0	1.0	1.0	1.0	
India									
Silchar–Imphal	160	160	Rehabilitation road: 3	Relatively high: 4	Yes: 1	Low: 1	Low: -1	Low: 1	11.5
Imphal–Moreh (BCP Myanmar)	95	160	Missing link: 4	Low, but future potential: 3	2* Yes: 2	Medium: 2	Security: -2	4	17
Myanmar									
Tamu–Kalewa	160	245	Rehabilitation road to BCP: 3	Low, but future potential: 3	Yes: 1	Medium: 2	Security: -2	4	13.5
Kalewa–Monya	186	95	Missing link, not on border but essential: 4	Low but some future potential: 2	Not clear: 0	Low: 1	Low: -1	Medium: 3	11
Thaton–Endu	70	128	Rehabilitation road not on border, important: 2	Medium to high, high future potential: 4	Yes: 1	Medium: 2	Low: -1	Low: 2	11
Endu–Kawkareik	70	150	Important rehabilitation road for connectivity: 3	Medium to high, high future potential: 4	2* Yes: 2	RIF to start: 3	Low: -1	High: 4	18.5
Kawkareik–Myawaddy BCP	46	37	Connecting to Thailand, high priority: 4	Medium to high, high future potential: 4	2* Yes	Thai budget partly finished: 3	Low: -1	High: 4	20
Dawei–Phu Nam Ron (BCP Thailand)	132	200	Missing link to border: 4	Low but future potential: 3	Yes: 1	Thai budget ongoing: 3	High: -3	High: 4	14
Keng Tung–Monglar	270	359	Rehabilitation road not to border: 2	High with future potential: 3	2* Yes: 2	Low: 1	Low: -1	Medium: 2	12
Monglar–Tachilek (BCP)	70	93	Missing link to BCP: 4	Some future potential: 2	2* Yes: 2	Low: 1	Ethnic, environmental: -2	Medium: 2	14
Thailand									
Myawaddy–Mae Sot	17	55	Missing link, border, high priority: 4	High traffic: 4	2* Yes: 2	Medium: 2	Low: -1	High: 4	19
Mae Sot–Tak	78	90	Rehabilitation road to border: 3	High traffic: 4	2* Yes: 2	RIF, Thai budget: 3	Low: -1	Medium: 3	17.5
Bangkok–Aranyaprathet	324	110	Rehabilitation to border: 3	High traffic: 4	2* Yes: 1	RIF, Thai budget: 3	Low: -1	Some: 2	14.5
BCP (Myanmar)–Kanchanaburi	80	160	Missing link to border: 4	Low but future potential: 3	Yes: 1	Low: 1	Low: -1	High: 4	15
Cambodia									
Aranyaprathet–Poipet (BCP Cambodia)	10	40	Missing link on border: 4	High traffic: 4	2* Yes: 2	Medium: 2	Land acquisition: -2	High: 4	18
Lao PDR									
BCP (Thailand)–Namxai	138	90	Rehabilitation road to BCP: 3	Some future potential: 2	2* Yes: 2	Low: 1	Low: -1	Medium: 2	12.5
Total	1,906	2,172							

* = double weighting, BCP = border crossing point, km = kilometer, Lao PDR = Lao People's Democratic Republic, RIF = Regional Investment Framework.

Source: See Appendix; author's compilation.

Table 18: New Rail Projects in Main Corridors

	Kolkata–Hai Phong (Yunnan)		Kolkata–Hai Phong (Savannakhet)		Kolkata–Hai Phong (Vientiane)		Kolkata–Saigon Port (Cambodia)		Dawei Port–Saigon Port	
	(km)	($ million)	(km)	($ million)	(km)	($ million)	(km)	($ million)	(km)	($ million)
Jiribam–Imphal (Manipur, India)	125	520	125	520	125	520	125	520		
Imphal–Moreh BCP (Myanmar)	95	400	95	400	95	400	95	400		
Tamu (BCP)–Kalay	127	98	127	98	127	98	127	98		
Kalay–Mandalay	539	162	539	162	539	162	539	162		
Three Pagodas Pass (Myanmar)			110	250	110	250	110	250		
Lashio–Ruili (BCP Yunnan)	142	480								
Three Pagodas Pass (Thailand)			153	490	153	490	153	490		
Bangkok–Aranyaprathet (BCP Cambodia)							260	15	260	15
Reconnecting with Cambodia							6	10	6	10
Khon Khaen–Mukdahan (Thailand)			320	1410						
Vientiane–BCP Viet Nam					480	1,920				
Savannakhet (Lao PDR)–Lao Bao (Viet Nam)			220	4,200						
Savannakhet–Mukdahan			15	75						
Lao Bao (Viet Nam)–Dong Ha			80	600						
Vinh (Viet Nam)–BCP (Lao PDR)					70	280				
Ha Noi–Lao Cai (BCP Yunnan Province)	260	149								
HCMC–Loc Ninh (BCP Cambodia)							129	900	129	900
Loc Ninh–Phnom Penh (Cambodia)							254	1,100	254	1,100
Phnom Penh–Poipet (BCP Thailand)							386	175	386	175
Nam Tok–BCP Thailand									30	75
BCP Myanmar–Dawei									130	325
Total (1)	1,288	1,809	1,784	8,205	1,699	4,120	2,184	4,120	1,195	2,525
Total (2)	1,288	1,809	1,784	5,105			2,178	4,110	1,189	2,515

BCP = border crossing point, km = kilometer, Lao PDR = Lao People's Democratic Republic, RIF = Regional Investment Framework.

Note: Total (2) Savannakhet–Lao Bao based on Thai construction costs, or $1,100 million. Kolkata through Bangladesh would require an additional 10 km of rail project at $15 million.

Source: See Appendix; author's compilation.

Table 19: Scoring of Rail Investment Projects

	Distance (km)	**Cost** ($ million)	**Connectivity**	**Traffic**	**Project Recognition**	**Project Preparedness**	**Socio-Environmental Problems**	**Benefit Sharing**	**Total**
Weight			1.5	1.0	2.0	1.0	1.0	1.0	
Jiribam–Imphal (Manipur, India)	125	520	Rail connection to Manipur: 3	No traffic, some future potential: 2	2* Yes	Low: 1	Security: -1	Low: 1	11.5
Imphal–Moreh (BCP Myanmar)	95	400	Connecting to border: 4	No traffic, some future potential: 2	1 Yes	No: 0	Security: -2	Medium: 3	11
Tamu (BCP)–Kalay	127	98	Connecting to border: 4	No traffic, some future potential: 2	1 Yes	No: 0	Security: -2	Medium: 3	10
Kalay–Mandalay	539	162	Rehabilitation of existing line but connecting: 2	Limited traffic, some future potential: 3	1 Yes	No: 0	No impact: 0	Low: 2	9
Three Pagodas Pass (Myanmar)	110	250	Connecting to border: 4	No traffic, medium future potential: 3	1 Yes	Low: 1	Some impact: -2	High: 4	13
Lashio –Ruili (BCP Yunnan)	142	480	Connecting to border: 4	No Traffic, high future potential: 4	2* Yes	Low: 1	Some impact: -2	High: 4	17
Three Pagodas Pass (Thailand)	153	490	Connecting to border: 4	No traffic, high future potential: 3	1 Yes	Low: 1	Possible high impact: -3	High: 4	12
BCP Myanmar–Dawei	130	325	Connecting to border: 4	No traffic, high future potential: 3	1 Yes	No: 0	Some impact:-2	High: 4	12
Nam Tok–BCP (Thailand)	30	75	Connecting to border: 4	No traffic, high future potential: 3	1 Yes	No: 0	Low impact: -1	High : 4	13
Bangkok–Aranyaprathet (BCP Cambodia)	260	15	Rehabilitation of line and connecting: 3	Limited traffic, high future potential: 3	1 Yes	Low: 1	No impact: 0	High: 4	13.5
Phnom Penh–Poipet (BCP Thailand)	386	175	Rehabilitation of line and connecting: 3	Limited traffic, some future potential: 3	1 Yes	High: 3	Some impact: -1	High: 4	14.5
Ha Noi–Lao Cai (BCP Yunnan)	260	149	Rehabilitation of line and connecting: 3	High traffic and future potential: 4	2* Yes	High: 3	No impact: 0	High: 3	18.5
HCMC–Loc Ninh (BCP Cambodia)	129	900	Connecting to border: 4	No traffic, medium future potential: 3	1 Yes	No: 0	High impact: -3	High: 3	10
Loc Ninh–Phnom Penh (Cambodia)	254	1,100	Connecting to border: 4	No traffic, medium future potential: 3	1 Yes	No: 0	High impact: -3	High: 3	10
Total	2,740	5,139							

* = double weighting, BCP = border crossing point, HCMC = Ho Chi Minh City, km = kilometer.

Source: Regional Investment Framework 2013 in ADB (2013), ADB–SASEC (2013), Government of India (2012), BIMSTEC (2014); ADB (2010) GMS Railways, author's estimates.

5. OBSTACLES AND CONSTRAINTS TO CROSS-BORDER INVESTMENTS

Implementing even a reduced list of road and rail projects is not going to be easy. There are serious obstacles and constraints to cross-border investments in transport infrastructure in South Asia and Southeast Asia. While reviewing these obstacles and constraints below, no attempt was made to prioritize them.

High Cost of Land Transport Infrastructure and Low Traffic

The vast majority of the trade between South Asia and Southeast Asia is by sea with little transiting by land through Myanmar. Sending goods by sea is cheaper—the question is whether the time saved through traveling by road is sufficient to attract freight.[18] Minimal road connectivity already exists. Building a seamless road corridor between India and Viet Nam requires a full program of road rehabilitation and widening, and sometimes complete reconstruction. The total cost of such programs as illustrated above is going to be high. Such investments would benefit individual countries and domestic trade. However, with the current traffic situation, incremental regional economic benefits may be low and economic justification would be a constant problem. One could try to argue that regional freight traffic is low because roads are in poor condition, with serious hindrances from delays and procedures at BCPs. Providing good road infrastructure would increase regional trade. However, would it increase enough to justify the high costs of new cross-border infrastructure?

South Asia–Southeast Asia Connectivity versus Regional and National Connectivity

For the respective governments in South Asia and Southeast Asia, beyond the political rhetoric, national connectivity and regional GMS or SASEC connectivity come first. This is perfectly logical. In India, connectivity by road and rail to the northeastern states is far from satisfactory. In 1991, India launched the Look East policy but concrete realizations started in 2002–2003. This translated into efforts to finance roads in Myanmar near the border with India in order to establish effective corridors and reach the rest of Southeast Asia by land. Despite such moves, strengthening corridors with and through Bangladesh remains probably the main concern for India. Bangladesh is making strong efforts to strengthen its road and rail networks, and increase its overall transport capacity. Connectivity with Southeast Asia for Bangladesh is not a first priority. Connecting with the PRC seems to be a more pressing issue for Bangladesh.

Within the GMS, the situation is again different and varies by country. Thailand has an effective paved road network with important corridors with four-lane highways. Viet Nam has a complete paved road network but congestion prevails on the main corridors. The country is putting in place an ambitious program of expressways to relieve congestion. Implementation is slow, however. Much progress has been realized to complete the road network in Cambodia and the Lao PDR. However from a regional perspective, more specifically in the Lao PDR, there is a need to develop transit corridors connecting Thailand to northern Viet Nam. Despite long periods of instability and ethnic wars, Myanmar has been able to achieve a paved road network with connections to major cities. The story of connecting with India

[18] BIMSTEC (2007) argues that Bangkok–Kolkata by sea was 4,020 km, $2,325 for a 10t/TEU shipment taking 26 days, with traveling by land being 4,323 km, and $4,583 for 19 days. The author has revised calculations and found the distance by sea to be 5,360 km (2,894 nautical miles) and the distance by road to be 3,540 km. This would normally increase the shipping cost. But more important are the changes to land time and cost which become 14 days (35 km/hour, 10 hours driving/day, 4 days for BCPs) at maximum $4,000.

and Thailand is not so successful.[19] The "trilateral highway" linking India to Thailand through Myanmar has been on the agenda for more than 15 years with only 160 km built from Tamu to Kalewa, ending nowhere. Myanmar is currently facing high pressure to improve its domestic transport infrastructure to support the badly needed economic growth expansion, and connecting with India does not seem to be its first priority. So far GMS countries have not expressed clear desire to improve connectivity with South Asia.

Lack of Demand, Trade Patterns, and Land Transit Traffic

Bangladesh, Nepal, and Bhutan export little to Southeast Asia. However, like India, they import goods from Thailand (electronic goods, household products, cars, and rice). There is a relatively small but growing trade between India and Southeast Asia. India imports large quantities of coal (from Indonesia), palm oil (from Malaysia and Indonesia), and oil and gas products (from Malaysia and Singapore). India exports trucks and vehicle parts to GMS and ASEAN countries. India also imports—as measured in value—large volumes of gold and precious stones. Because of the type, origins and volume of traded goods, it is not surprising that most of the South Asia–Southeast Asia trade in volume is by sea.

There is also a lack of demand for transit freight traffic by land through Myanmar. Northeast Indian states have little capacity to generate exports for Myanmar and the rest of Southeast Asia. The income per capita of the Northeast Indian states is lower than the India average and there are still many pockets of poverty. Most of the export goods come from Kolkata, located more than 1,500 km away. This explains the low traffic recorded at the Moreh/Tamu border. But this is not the only reason why traffic is low at the BCP. There is a large volume of PRC goods coming from Yunnan Province and entering India that is not recorded—the unrecorded volume is estimated to be as much as 10 times the recorded volume. The three active border crossings in Myanmar are Mae Sot and Mae Sai with Thailand, and Ruili with Yunnan Province. In the medium term, Myanmar trade prospects with Thailand and Yunnan Province continue to be better than with India.

Road Corridors and Border Crossing Procedures

It is important to stress that building effective road corridors between South Asia and Southeast Asia would only bring trade increases if border crossing facilities and procedures are significantly improved. This question is discussed elsewhere. It covers the issue of customs facilities, harmonization, and the signing of multilateral transport agreements. An important step could be the ratification of a transport transit agreement between India, Myanmar, and Thailand.

The Challenge of Connecting Disjointed Railway Networks

Connecting disjointed railway networks from South Asia to Southeast Asia is going to be a formidable and expensive challenge. Firstly, rail connectivity is far from being complete in SASEC and the GMS.

In the GMS, rail connectivity discussions have centered on the ASEAN objective of building a rail connection between Kunming and Singapore. Progress, however, has been extremely slow. There is still no agreement among ASEAN members on the best route. Whatever the final route, there are many missing links and the cost of building new lines in mountainous terrain is high, being easily $4 million–$5 million per kilometer.[20] Furthermore, before thinking of regional connectivity, countries like Viet Nam, Cambodia, and even Thailand need to modernize and strengthen their railway operations. In all cases, freight traffic has been declining. Poor track infrastructure and old rolling stock have negatively affected the

[19] "The highway has been on the agenda for 15 years. The Indian government spent $30 million building 100 miles (160 km) of new road from the India–Myanmar border at Moreh/Tamu across Sagaing Division in 2001, but it still ends in dust and mud in the middle of nowhere" (*The Irrawady,* 17 October 2013).

[20] Average cost derived from Table 18.

competitiveness of rail operations compared to road freight services. Railways are now public enterprises carrying mostly passengers at discounted prices and therefore running substantial operational deficits year after year. The above analysis has shown how expensive it could be to build connecting rail corridors. In that context it is hard to see how rail connectivity with South Asia could receive priority in the medium term.

There is better internal rail connectivity in South Asia, and in particular in SASEC because of the history of railway development in India—however, problems persist. Rail connectivity between India and Bangladesh is far from adequate. There are only a few entry points, many missing links, rail gauge differences, and transshipment problems.[21] Some of the capitals of the Northeast Indian states are not yet rail connected. There, rail gauge was traditionally of the meter type, but India Railways has decided to convert all of them to the now common Indian broad gauge. This represents a heavy burden on the Indian government budget. In this context, despite good intentions, rail connectivity with Myanmar is likely to receive second priority.

Indian Financial Support for South Asia–Southeast Asia Connectivity

India launched the Look East policy in 2003 and moved to promote and give financial help for the development of two road corridors in Myanmar to improve connectivity. These were the "Trilateral Highway" project and the Kaladan project. Despite signing memorandums of understanding and some already completed construction, progress has been slow and could be considered as being stalled in Myanmar. India has a past record of being behind schedule for implementing infrastructure like roads and international comparison programs. India's economy is currently experiencing financial difficulties and it is likely that the funding of transport infrastructure projects in the northeastern states and Myanmar would be affected. India has been asked by Thailand to participate in the development of Dawei but has not yet confirmed any financial involvement.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The conclusions are in the form of six specific statements elaborated below. It should be reminded that cross-border investments in the "conclusions" and "recommendations" for most of them are only at the project identification stage. In order to go ahead and be implemented, they would have to be submitted to strict feasibility studies.

Conclusion 1: Road corridor options to connect South Asia to Southeast Asia have been evaluated and the best option is the Kolkata–Saigon Port Corridor through the Chicken's Neck.

The Kolkata–Saigon Port Corridor is 4,430 km long and would require a total investment of $3 billion to offer adequate road connectivity between South Asia and Southeast Asia. Of the $3 billion, $1.9 billion would come from the road program that India is slowly implementing for the northeastern states independently of the objective of connectivity with Southeast Asia. A shorter road corridor with less required investment would be a road corridor through Bangladesh. There are a few reasons why this is not the preferred option: (i) two additional BCPs causing delays, increased costs, and transshipment; (ii) Myanmar's objection to connecting with Bangladesh via Teknaf BCP and Cox's Bazar means that Bangladesh has little interest in land connectivity with Southeast Asia; and (iii) the road corridor would not provide easy access to goods from Nepal or Bhutan.

[21] In reality only one is working effectively.

The road corridor from Kolkata to Hai Phong has too many missing links making it more expensive, and with fewer economic prospects it is definitely not a preferred option in the medium term. In the long run, the corridor could be built once the Lao PDR manages to establish an effective road link with North Viet Nam through Dien Bien Phu.

Conclusion 2: Rail connectivity between South Asia and Southeast Asia was also evaluated, with the Kolkata–Saigon Port Corridor and connections through Yunnan Province in the PRC being the preferred options; implementation, however, should come after national railways have realized substantial modernization reforms.

Rail connectivity comes as a second priority after road connectivity. The Kolkata–Saigon Port Corridor, at a length of 4,770 km, is going to require investments of already $4.1 billion, without accounting for gauge conversion and rehabilitation costs in India from Kolkata to Jiripam. The rail connection through Yunnan Province to reach Ha Noi and Hai Phong Port offers substantial savings with a total cost of $1.8 billion and a length of 4,225 km.

Conclusion 3: The focus of the report was on land connectivity, though almost all trade between South Asia and Southeast Asia is by sea. Analyzing port connectivity is the subject of a different report. Correlating required investments with improvements in South Asia–Southeast Asia connectivity is going to be very difficult.

There is very little transit through the border between India and Myanmar, implying that almost all trade between South Asia and Southeast Asia is by sea. Trade flows and shipping routes between South Asia and Southeast Asia involve many ports: Kolkata, Chennai, Colombo, Chittagong, Yangon/Thilawa, Penang, Port Klang, Port of Tanjung Pelapas, Singapore, Bangkok, Laem Chabang, Tanjung Priok, Saigon Port/Vung Tau, and Hai Phong.

South Asia–Southeast Asia trade is growing but still limited, and this trade, for the ports listed above, would likely account for only a small fraction of their international throughput. The ports all have plans to install additional capacities. However, correlating the incremental capacity with current and future trade would be an extremely difficult task.

Conclusion 4: Though the focus here was on land corridors, the prospect of developing a multimodal corridor linking Bangalore and Chennai to Dawei, Laem Chabang, and Saigon Port has been noted.

Major changes in trade flows could be on the horizon in the Gulf of Bengal. The desire to strengthen manufacturing production along the Indian east coast with greater supply chain integration between Indian producers and Thai/Japanese producers (car assembly) points to the development of a strong maritime corridor between Chennai and Dawei Port in Myanmar. Eventually, other ports of the Indian east coast and other Myanmar and Southeast Asia ports may be part of this new industrial expansion. This also implies that building good transport infrastructures between Thailand and Myanmar for Dawei should be supported.

Conclusion 5: Land corridors discussed in the report are transport corridors. Transforming them into economic corridors would take time and require many steps. The suggested approach is to first develop economic links in more limited geographic areas.

Designing transport corridors in regional groupings was always intended to be only the first step, with the objective being to establish economic corridors. So far, in CAREC and the GMS, the results have been deceptive. An economic corridor is a corridor where, because of transport improvements and better connectivity, new economic activities can take place. It is argued here that instead of intending to transform the full transport corridor into an economic corridor, it should be better to work with the concept of economic links defined along a more restrictive geographic area. For instance, in the case of the Kolkata–Saigon Port Corridor, the potential economic links could be an area around the Myawaddy/Mae Sot BCP covering, for instance, Tak in Thailand and Kawkareik or Thaton in Myanmar. A second potential economic link could be around the India–Myanmar border (Moreh/Tamu) including the towns of Imphal (Manipur) and Kale (Myanmar).

Conclusion 6: Linking trade and transport has been one of the main elements behind the design of the corridors. However, a factor that is often overlooked is the social benefits associated with greater connectivity. One of the first impacts of an improved corridor is the increase in passenger and tourist movements across borders.

Evaluation of GMS transport corridors has revealed that one of the immediate, clear benefits of cross-border road improvements was the significant increases in passenger/tourist movements mostly by buses, but also by cars.[22] Increased cross-border passenger movements have positive effects on economic growth and also contribute to developing social bonding among populations.

6.2 Recommendations

Recommendation 1: Construct the recommended road and rail priority corridors in phased implementation periods as suggested in Tables 20–22.

The effective road corridor in Northeast India would not be completed before 2020. Therefore it is only in the 2020–2025 period that the seamless Kolkata–Saigon Port Corridor could be expected to be finished. There are serious doubts about the economic justification of rail corridors. Constructing South Asia–Southeast Asia rail corridors will only take place once the national railways have carried out successful modernization and reforms to make their operations attractive and profitable. Therefore, the bulk of the construction of the rail missing links would be well after 2020 and more likely in 2025 onward.

[22] This was the case in the crossing between Mukdahan (Thailand) and Savannakhet (Lao PDR), Dan Savan (Lao PDR) and Lao Bao (Viet Nam), Bavet (Cambodia) and Moc Bai (Viet Nam), and Aranyaprathet (Thailand) and Poipet (Cambodia).

Table 20: Phased Transport Corridor Implementation Policy

	Road Sector Activities	**Rail Sector Activities**
2014	Feasibility studies for priority road projects	Master plans for national railway modernization in Thailand, Viet Nam, and Myanmar to map and critically review future directions Complete connection in Viet Nam
2015–2020	Building missing links and carrying out rehabilitation on roads leading to key BCPs in South Asia–Southeast Asia connectivity Completion of the four-laning project from Kolkata to Imphal (Manipur, India) Build Dawei Port and industrial park Feasibility studies and detailed design for road connection projects for 2020–2025 Through multilateral agreements, harmonize and ease procedures at BCPs; implement an effective transport transit agreement	Implement national modernization programs in Thailand, Viet Nam, and Myanmar Feasibility study of linking the Lao PDR to Thailand and Viet Nam railway networks Feasibility studies and detailed design for rail connection projects for 2020–2025 Construction of committed projects in Bangladesh and Cambodia
2020–2025	Complete Kolkata–Saigon Port road projects not covered under the 2015–2020 period Complete development of Dawei and its integration in the multimodal corridor, Chennai–Dawei–Bangkok–Laem Chabang–Saigon Port Rehabilitate road connections in Myanmar to Mae Sai and build road connection from the Lao PDR to Dien Bien Phu (Viet Nam)	Build rail connection to Dawei Port Build rail connection between Indian railway and Myanmar railway (Moreh–Kalay) Build connection from Myanmar to Yunnan Detailed design of the Kolkata–Hai Phong rail connection to be built 2025–2030 Complete modernization program and start building high-speed trains if economically justifiable
2025–2030 and beyond	After evaluating success of the Kolkata–Saigon Port Corridor, build the missing links in the Kolkata–Hai Phong corridor	Build missing links in Myanmar, Thailand, and the Lao PDR for the Kolkata–Hai Phong and Kolkata–Saigon Port corridors

Lao PDR = Lao People's Democratic Republic.

Source: Author.

Table 21: Detailed Road Projects by Phase

	Road Projects	**Distance** (km)	**Cost** ($ million)
2014			
GMS	Feasibility studies and detailed design for priority projects		10
2015–2020			
India	Imphal–Moreh	95	160
Myanmar	Endu–Kawkareik	70	150
	Kawkareik–Myawaddy	60	37
Thailand	Myawwaddy–Mae Sot	17	55
	Mae Sot–Tak	78	90
Cambodia	Aranyaprathet–Poipet	10	40
India	75% completion of the four-lane highway from Kolkata to Imphal (25% completed by 2014)	811	935
Thailand	BCP–Kanchanaburi	80	160
Myanmar	Dawei–Phu Nam Ron (BCP)	132	200
Myanmar	Dawei Port construction and part of Dawei industrial park		(2,000)
	Feasibility study and detailed design for roads to be built in 2020–2025		10
Total		1,353	1,837
2020–2025			
India	Completion of the Kolkata–Imphal	405	468
Myanmar	Tamu–Kalewa	160	245
	Kalewa–Monya	186	95
	Payagi/Thaton–Endu	151	128
Thailand	Bangkok– Aranyaprathet	324	110
Myanmar	Keng Tung–Loilem	270	359
	Monglar–Keng Tung	70	93
Lao PDR	BCP (Lao PDR)–Namxai	138	90
	Feasibility studies and detailed design of roads for 2025–2030		10
	Complete Dawei development within maritime corridor		6,000
Total		1,704	1,598
2025–2030 (and beyond)			
Lao PDR	BCP (with Viet Nam)–Namxai	138	90
	Ban Houayxay (BCP with Thailand)–Namxai through Natuei, no project listed but rehabilitation needed	235	
Viet Nam	Dien Bien Phu–BCP (with Lao PDR) no project listed but rehabilitation would be needed	30	
	Dien Bien Phu–Ha Noi, rehabilitation needed on some road sections	309	
	Not listed here, but with increasing traffic, four-laning would be required on Moc Bai–Ho Chi Minh City	80	
Myanmar	Not listed here, but with increasing traffic, four-laning would be required on road sections such as Bago–Thaton	20	
Cambodia	Not listed here, but with increasing traffic, four-laning would be required on some road sections such as Poipet–Phnom Penh and to Bavet	365 158	
Total		1,335	N/A

BCP = border crossing point, GMS = Greater Mekong Subregion, km = kilometer, Lao PDR = Lao People's Democratic Republic.

Source: See Appendix; author's compilation.

Table 22: Detailed Rail Projects by Phase

	Rail Project	**Distance** (km)	**Cost** ($ million)
2014			
Myanmar, Thailand, Viet Nam	Plans for national railway modernization including critical review to map future direction		10
Viet Nam	Completion of Lao Cai–Ha Noi project	260	149
Total		260	159
2015–2020			
Myanmar	Modernization of railway network		(6,000)
Thailand	Modernization of railway network		(6,000)
Viet Nam	Modernization of railway network		(6,000)
Thailand	Feasibility study of linking Laem Chabang with Dawei		3
Lao PDR, Thailand, Viet Nam	Feasibility study of railway network linking the Lao PDR to Thailand and Viet Nam		3
India, Myanmar	Feasibility study and detailed design of rail connections India–Myanmar		10
Cambodia	Phnom Penh–Poipet (Thailand BCP)	386	175
Thailand	Bangkok–Aranyaprathet (Cambodia BCP)	260	15
Myanmar	Detailed design and start (50%) of construction, Lashio–Ruili	70	240
Bangladesh–India	Akhaura–Agartala new rail line	15	15
Total		731	461
2020–2025			
Myanmar	Completion of the Lashio–Ruili project	72	240
Myanmar	Myanmar–Dawei BCP	130	325
Thailand	Nam Tok–BCP Thailand	30	75
India	Construction of missing Imphal–Moreh link	95	400
Myanmar	Rehabilitation of Mandalay–Kalay	539	162
Myanmar	Construction of missing Kalay–Tamu link	127	98
Cambodia, Viet Nam, Lao PDR	Feasibility studies and detailed design of rail connections in Cambodia, the Lao PDR, and Viet Nam		10
Total		993	1,310
2025–2030 (and beyond)			
	Ho Chi Minh City–Loc Ninh (Cambodia BCP)	129	900
	Loc Ninh–Phnom Penh (Cambodia)	254	1,100
	Vientiane–Viet Nam BCP	480	1,920
	Vinh (Viet Nam)–BCP (Lao PDR)	70	280
Total		933	4,200

BCP = border crossing point, Lao PDR = Lao People's Democratic Republic.

Source: See Appendix; author's compilation.

Recommendation 2: Regional cooperation initiatives for building cross-border road infrastructure would be justified when the implied net benefits for the two participating countries are higher than the net costs. This would not be the case for road corridors, especially in Myanmar. This implies that India and Thailand would need to finance some road developments in Myanmar constituting the key sections of the transport corridor.

The success of building seamless transport corridors would depend on whether participating countries could perceive it as a win–win situation. Tables 23 and 24 show that some countries would bear a far higher cost than other countries. Participating countries are at different levels of wealth, as measured by the disparities in income per capita. National and regional economic benefits have not been calculated but there is no doubt that a "financial sharing mechanism" would need to be put in place to guarantee a win–win situation for all.

Table 23: Road Project Cost by Phase and Country
($ million)

	2014	2015–2020	2020–2025	2025–2030	Total
India		1,095	468	Undefined	1,563
Myanmar		387	920	Undefined	1,307
Thailand		305	110	Undefined	415
Cambodia		40		Undefined	40
Lao PDR			90	Undefined	90
Viet Nam				Undefined	0
TA projects	10	10	10	Undefined	30
Total	10	1,837	1,598		3,445

Lao PDR = Lao People's Democratic Republic, TA = technical assistance.

Source: See Appendix; author's compilation.

Table 24: Rail Project Cost by Phase and Country
($ million)

	2014	2015–2020	2020–2025	2025–2030	Total
India			400		400
Bangladesh		15			15
Myanmar		240	825		1,065
Thailand		15	75		90
Cambodia		175		1,100	1,275
Lao PDR				1,920	1,920
Viet Nam	149			1,180	1,329
TA projects	10	16	10		36
Total	159	461	1,310	4,200	6,130

Lao PDR = Lao People's Democratic Republic, TA = technical assistance.

Source: See Appendix; author's compilation.

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APPENDIX: POSSIBLE ROAD, RAIL, AND PORT PROJECTS UNDER SOUTH ASIA–SOUTHEAST ASIA CONNECTIVITY

Project Description	Corridor Reference	Distance (km)	Estimated Cost ($ million)	Reference	Current Status
Road Potential Projects					
GMS					
Cambodia					
Poipet Ring Road	Southern Corridor	7	15	TA 7557, RIF 2013	See Thailand below
Phnom Penh Ring Road	Southern Corridor	20	50	TA 7557, RIF 2013	Need FS, provisional rough author estimate
Neak Loung Mekong Bridge on RN 1	Southern Corridor	3	[200]	TA 7557	Under construction by Japan
Kampot border (Ha Tien)	Southern Coastal Corridor	15	20		Under ADB loan
Subtotal		45	85		
Lao PDR					
Third Friendship Bridge on Mekong between Nakhom Phanom and Thaikek (RN 13)	Not part of corridor	0	0		Completed in November 2011
Thaikek to Viet Nam border on RN 12	Not on corridor but connecting Central to Eastern Corridor	293	300	ASEAN Strategic Transport Plan 2011–2015, November 2010	Not listed in RIF 2013; preliminary cost estimates by author
Ban Lao to Viet Nam border on RN 8	Not on corridor but connecting Central to Eastern Corridor	132	80	RIF 2013	ADB OCR (phase 1 only); connection to Vinh
Fourth Friendship Bridge between Thailand and the Lao PDR between Houayxay and Chiang Kong on Mekong	North–South Corridor (last missing link)	0	0	RIF	Under construction, expected for 2014, financed by Thailand and the PRC
Luang Prabang Xam Neua (NR 1 connecting to Viet Nam)	Links with GMS corridors NSC, NS, and ENS	250	70	RIF 2013	Road paved, need rehabilitation; could be part of India–Ha Noi Corridor
Muong Ngeun–Chompet–Luang Prabang (from Chiang Mai, Thailand)	Not directly on GMS corridor, tourism corridor	120	90	RIF 2013	Detailed design ongoing, NEDA funding; could be part of India–Ha Noi Corridor
Luang Prabang–Dien Bien Phu	Not on GMS corridor, tourism corridor	107	90	RIF 2013	DD planned, Viet Nam loan; possible India–Ha Noi Corridor
Luang Namtha–Xiengkok–Lao Myanmar Mekong Bridge (NR 17)	Myanmar–Lao PDR–North Viet Nam Corridor	140	150	RIF 2013	DD ongoing, bridge cost shared by Myanmar and Lao PDR; private investment
Subtotal		1,042	780		
Myanmar					
Kawkhareik–Eindu	EWEC Corridor	68.4	150	TA 8330-MYA, RIF 2013	Under FS and DD by ADB (TOR)
Endu Thaton Payagyi	EWEC Corridor	151	128	TA 8330-MYA, RIF 2013	Maintenance under local BOT; upgrading and repair
Mae Sot–Kawkhareik	EWEC Corridor	60	37	TA-7851-REG, TA8330-MYA	Thai budget, under construction
Mae Sot Bridge and bypass	EWEC Corridor	4	10		See Thailand for more details
Kaladan Multimodal Transit Project	Not on GMS corridor	287	134	BIMSTEC Inception Report	Financed by India but under serious delays
Monya–Kalewa	Northern Corridor	186	95	Mentioned in Myanmar plan	Built by India; BIMSTEC report notes that road needs rehabilitation

Kalewa–Tamu	Northern Corridor	160	245	Myanmar and India	Built by India BRO and said to be in relatively good condition; bridges need improvements
Loilem–Keng Tung road section (359 km) (GMS road section of R7 and secondary road of corridor)	Connect Northern Corridor with North Corridor	359	359	TA GMS, RIF 2013	Preliminary cost estimate; possible India–Ha Noi Corridor
Keng Tung–Tachilek	Connect Northern Corridor with North Corridor	140	135 (70 km and $93 million for Monglar Keng Tung)	TA GMS, RIF 2013 refers to PRC–Tachilek	Rehabilitation of existing road; preliminary cost estimate; possible India–Ha Noi Corridor
Tamu–Bagan/Mae Sot (Trilateral Mekong Highway)	India–Mekong Corridor	1,360	700	BIMSTEC	Cost estimates might need to be revised
Border with Thailand–Dawei	GMS South/South Coastal Corridor	132	200	BIMSTEC, GMS and ASEAN pipeline	Preliminary road built; author's estimate
Thilawa–East Dragon Road	Port access improvement	33	41	ASR, RIF 2013	To optimize functioning of the port
Subtotal		1,593 [2,019]	1,534 [1,569]		In [ ] with Trilateral Mekong Highway
Thailand					
Bang Yai–Kanchanaburi	GMS South Coastal	95	1,600	Thailand Interim Report BIMSTEC, RIF 2013	Expressway (2015–2017), ADB lending envisaged; RIF cost estimate only $300 million
Kanchanaburi–BCP with Myanmar	GMS South Coastal	80	160	Thailand Interim Report BIMSTEC	First four-lane roads, then later motorway at $1.2 billion
Tak–Mae Sot	EWEC	78	90	Thailand Interim Report BIMSTEC	Rehabilitation of four-lane highway by Thai budget 2015–2017; BIMSTEC estimate $65 million
Mae Sot–Myawaddy new bridge and BCP connection	EWEC	13	45	Thailand Interim Report BIMSTEC; RIF 2013	Not clear financing (DOH, ADB?); RIF estimate only $30 million
Aranyaprathet–Poipet Bypass (partly in Thailand, partly in Cambodia)	South Corridor	12	25	RIF 2013, BIMSTEC	Indirectly important for connectivity SA–SEA
Phanom Sarakan–Sa Kaeo	South Corridor	73	110	TA 7557	Four-laning planned to improve connectivity; author estimate
Khon Khaen–Mukdahan	EWEC	210	140	BIMSTEC Thailand Interim Report	Improvement of four-lane highway
Laem Chabang Port improved road connectivity	Not on corridor (expansion from four-lane to eight-lane motorway from port to Nong Kham)	8	80	Thailand Interim Report BIMSTEC	Thai budget, 2013–2015
Subtotal		569	2,250		
Viet Nam					
Southern Coastal Corridor	GMS SCC	90	37	RIF 2013	Detailed design, BCP
Southern Coastal Corridor	GMS SCC	90	373	RIF 2013	Construction, ADB loan and government share
Subtotal		180	410		
GMS road projects total		3,429	5,059		
SASEC					
Bangladesh					
Burimari–Rangpur (Burimari–Lalmonihat)	SAARC Corridor	138	50	SASEC SOM, in ADB program	Part of road connection under FS, possible ADB lending
Burimari BCP (ICD)	SAARC Corridor	0	3	In ADB program	Committed
Benapole BCP (ICD expansion)	SAARC Corridor	0	25	In ADB program	To relieve Benapole congestion
Dhaka–Tanggay	SAARC Corridor	70	386	In ADB program (4	Cofinanced by ADB, Abu

				lanes)	Dhabi Fund, and OPEC
Dhaka–Chittagong Expressway	SAARC Corridor	215	1,600 (grade) 8,500 (elevated)	SASEC SOM, in ADB program	ADB currently conducting the FS/DD ($10 million)
Chittagong–Cox's Bazar–Teknaf	SAARC Corridor	225	500	In Bangladesh Road Program	Undergoing feasibility study
Subtotal		648	2,564		
India					
Karkavita–Phulbari–Banglabandha	SAARC Corridor	47	90	In ADB pipeline	Nepal to Mongla/Chittagong
Phuentsholling–Hashima–Changrabandha	SAARC Corridor	140	120	In ADB pipeline	Bhutan to Mongla/Chittagong
Phuentsholling ICD and bypass road	SAARC Corridor		10	In ADB pipeline	For Bhutan trade and connectivity
Imphal Moreh	Direct connectivity to GMS	85	160	In ADB pipeline	FS/DD under preparation; could also contained $60 million for alternative road
Siliguri Guawati	SAARC Corridor	441	660	Indian budget	Four-lane highway, Assam Highway but less than 25% completed; author estimate
Guawati Silchar	Northeast India Corridor	417	480	Indian budget	Four-lane highway Northeast India project
Silchar Imphal	Northeast India Corridor	160	160	Indian budget	Author estimate
Kolkata Siliguri	Northeast India Corridor	560	807	Indian budget BIMSTEC	Slow ongoing four-lane project
Kolkata to Petrapole/Benapole	SAARC Corridor	80	160	Indian budget	Delayed because of land acquisition problems
Lawngtlai Mobu	Kaladan Corridor	117	100	Indian budget	Part of the Kaladan–India–Myanmar Corridor
Moreh ICP	Part of ICP program	0	20	Indian budget	High priority, though program very delayed
Subtotal		1,623	2,637		
SASEC road projects total		2,271	5,201		
Road projects total		5,700	10,260		
Railway Projects					
GMS					
Cambodia					
Rehabilitation of railway line (north section)	Part of Singapore–Kunming Rail Line	338	95	ADB loan with partners	Toll operating on southern portion; estimate based on cost of southern portion ($73 million)
Construction of missing link Sisophon–Poipet	Part of Singapore–Kunming Rail Line	48	80	ADB loan with partners	Was delayed because of land settlement problems
Phnom Penh–Loc Ninh (Viet Nam)	Part of Singapore–Kunming Rail Line	257	1,100	ADB ASR, TA 7557, RIF 2013	FS completed, financed by PRC; may be financed by PRC (original cost was $480 million)
FS: connecting Phnom Penh Port with city	Port connection	53	1	RIF 2013	Feasibility study only
Subtotal		696	1,276		
Lao PDR					
Nhong Kai Bridge–Thanaleng (Vientiane)	Part of Singapore–Kunming Rail Line	4 (13)	50	ASEAN, GMS program; RIF 2013	To be financed by NEDA; original cost was $20 million
Boten/Mohan–Vientiane	Part of Singapore–Kunming Rail Line	421	7,200	PRC financing; RIF 2013	MOU signed; expected soft loan from the PRC
FS Vientiane–Thakaek–Muya	Connecting with Viet Nam (EWEC)	480	15	RIF 2013	Study, request for Republic of Korea grant
Savannakhet–Lao Bao	EWEC	220	4,200	RIF 2013	Private investment, BOOT, low priority
Subtotal		1,125	11,465		
Myanmar					

Rehabilitation Kalay Mandalay	SA–SEA connectivity	539	162	Myanmar Interim BIMSTEC	Financing TBD
Kalay–Tamu	SA–SEA connectivity	127	98	Myanmar Interim BIMSTEC	Financing TBD
Lashio–Muse–Ruili (BCP Yunnan)	SA–SEA connectivity	142	480	Myanmar Interim BIMSTEC	PRC loan
Muse/Ruili–Kyaukpyu Port	Myanmar–PRC connectivity	868	6,000	PRC proposal and financing	FS completed; railway will be a standard gauge
Three Pagodas Pass Railway	SA–SEA connectivity	110	250	ASEAN program, Myanmar Interim BIMSTEC	FS conducted by KOICA, concluding low economic viability
Yangon–Mandalay (double tracking and track improvement)	SA–SEA connectivity internal connectivity	1,242	310	Myanmar Interim BIMSTEC	Author estimate ($0.5 million/km)
Track upgrading Mandalay–Myitkyina	Internal connectivity	552	60	Myanmar Interim BIMSTEC	Author estimate ($0.5 million/km)
Track upgrading Bago–Dawei	SA–SEA connectivity internal connectivity	507	100	Myanmar Interim BIMSTEC, RIF 2013	Only $30 million in BIMSTEC report
Thailand–Dawei rail line	SA–SEA connectivity	160	400	Myanmar Interim BIMSTEC	Could connect with Three Pagodas Pass rail line; no FS; author estimate
Subtotal		4,247	7,590		
Thailand					
Railway Modernization Project	SA–SEA connectivity internal connectivity	Network	500	In GMS ADB RIF	Cofinanced (ADB 120)
Connection to Myanmar (Three Pagodas Pass)	SA–SEA connectivity (from Nam Tok to border)	153	490	ASEAN program, TA 7557 2nd Interim	FS conducted by KOICA raising doubts about economic viability
Bangkok–Aranyaprathet rehabilitation	SA–SEA connectivity	260	15	Thai railway	Could have been included in the network improvement
Reconnecting with Cambodia railway	SA–SEA connectivity	6	10	ASEAN Program GMS RIF, TA 7557	Awaiting completion of 48 km in Cambodia
Double tracking of Laem Chabang–Lat Krabang rail line	SA–SEA connectivity	85		Thailand Interim BIMSTEC	Completed in November 2012
Container Rail Terminal at Laem Chabang Port	SA–SEA connectivity	0	100	GMS RIF 2013	To reduce congestion created by road transportation
Study of Dawei–Laem Chabang Connection	SA–SEA connectivity	0	3	GMS RIF 2013	Budget for feasibility study
Rail connection to Dawei	SA–SEA connectivity	(40)	(130) included in Myanmar	Thailand Interim BIMSTEC	Would connect with the Three Pagodas Pass rail at Nak Tok; author estimate
Khon Kaen–Mukdahan–Nakhon Phanom	SA–SEA connectivity (EWEC)	320	1,410	RIF 2013	Estimated distance (210 km to Mukdahan); looking for funding
Subtotal		824	2,528		
Viet Nam					
Loc Ninh–Ho Chi Minh	Part of Singapore–Kunming Rail Line	129	900	ADB ASR; TA 7557	FS completed, may be financed by PRC; in past, FS cost was $570 million
Modernization of Viet Nam railway	Part of Singapore–Kunming Rail Line	Network	7,000	ADB ASR	Estimate in railway master plan; no implementation yet
Subtotal		129	7,900		
GMS railway projects total		7,021 (5,732)	30,759 (10,059)		In parentheses, only projects providing direct connection
SASEC					
Bangladesh					
Double tracking of Dhaka–Chittagong	SA–SEA connectivity	64 (part of distance)	300	SASEC program	Part of the $430 million ADB railway improvement program
Railway Connectivity Investment	SA–SEA connectivity	Network	1,000	SASEC program	Financed by ADB MFF;

Program: (i) Laksham–Akhaura Double Track Project; (ii) Dohazari–Cox's Bazar–Gundum (Myanmar Border); (iii) railway bridge parallel to Banglabandhu Bridge; (iv) Dhirasram Inland Container Depot including related investments under PPP-mode; and (v) procurement of rolling stock and improvement of maintenance.					FS and DD ongoing
Connecting Akhaura to Agartala	Key connecting link	10	4	India–Bangladesh MOU; NTDPC	Surveys completed but no construction yet; would be financed by India
Rail extension Chittagong to Cox's Bazar and Dugun	SA–SEA connectivity	187	300	TA 7557	
Subtotal		261	1,604		
India					
Connecting Akhaura to Agartala (Tripura)	Key connecting link	10	4	India–Bangladesh MOU; NTDPC	Surveys completed but no construction yet; would be financed by India
Jiribam–Imphal (Manipur)	SA–SEA connectivity New BG line	125	520	India/BIMSTEC	Planned completion for 2016; difficult mountainous terrain
Imphal–Moreh (BCP)	SA–SEA connectivity New BG line	95	400	India/BIMSTEC	Estimate based on Jiribam Imphal costs (TA 7557 gives only $650 million for Jiribam–Moreh)
Katarkal–Bairabi	SA–SEA connectivity BG line	0	0	NTDPC	Under construction
Bairabi–Aizawl (Mizoram)	SA–SEA connectivity New BG line	51	210	NTDPC	Under survey
Aizawl–Lawngtlai–Mobu (BCP with Myanmar)	SA–SEA connectivity New BG line	230	960	NTDPC	Along Kaladan Corridor, to provide access to Myanmar
Gauge conversion in Northeast Indian states	SA–SEA connectivity		2	NTDPC	In 2011, 1,454 km of BG and 1,148 km of MG; full BG gauge conversion by 2020 or earlier
Subtotal		511	2,096		
SASEC railway projects		772	3,700 (3,700)		
Railway projects total		7,793 (6,451)	34,459 (13,759)		
Port Projects					
GMS					
Cambodia					
Multipurpose terminal, Sihanoukville Port	Port connectivity		90	RIF 2013	Dry bulk and oil exploration terminals, JBIC loan
Myanmar					
Dawei Port	SA–SEA marine corridor, port connectivity		8,500	Myanmar–Thailand MOU	Private investor; looking for international funding, JICA to develop adjacent economic zone
Sittwe, Kyaukpyu, and Thilawa	SA–SEA port connectivity			ASR; BIMSTEC	All under construction with international financing; Thilawa already functioning
Thailand					
Laem Chabang Port Expansion (Basin III)	SA–SEA marine corridor, port connectivity			RIF 2013	Container terminal (bring capacity above 15 million TEUs); FS ongoing;
SASEC					
Bangladesh					

Chittagong new container terminal	SA–SEA marine corridor, port connectivity				Just completed; constructed and financed by the PRC
Sonadia Deep Sea Port	SA–SEA marine corridor, port connectivity		5,000		Under planning; PRC financing expected
India					
Kolkata Port expansion	SA–SEA port connectivity				
Sagar Island Deep Sea Port	SA–SEA marine corridor, port connectivity				
Chennai Port expansion	SA–SEA marine corridor, port connectivity				
Sri Lanka					
Colombo Port expansion	SA–SEA marine corridor, port connectivity		1,200	Colombo Port website	Container capacity to increase from 4 to 12 million TEUs; PRC financing
Hambantota Deep Sea Port	SA–SEA port connectivity		368	Colombo Port website	18 m draft, vessels of 100,000 DWT; PRC financing

ASEAN = Association of Southeast Asian Nations, ASR = assessment, strategy, and road map, BCP = border crossing point, BG = broad gauge, BIMSTEC = Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation, BOOT = build–own–operate–transfer, BOT = build–operate–transfer, BRO = border road organization, DD = detailed design, DOH = Department of Highways, DWT = deadweight tonnage, EWEC = East-West Economic Corridor, FS = feasibility study, GMS = Greater Mekong Subregion, ICD = inland container depot, ICP = integrated check post, JICA = Japan International Cooperation Agency, km = kilometer, KOICA = Korea International Cooperation Agency, Lao PDR = Lao People's Democratic Republic, m = meter, MFF = multitranche financing facility , MG = meter gauge, NEDA = Neighboring Countries Economic Development Cooperation Agency, NSC = North-South Corridor, NTDPC = National Transport Development Policy Committee, OCR = ordinary capital resources, PRC = People's Republic of China, RIF = Regional Investment Framework, SA = South Asia, SAARC = South Asian Association for Regional Cooperation, SASEC = South Asia Subregional Economic Cooperation, SCC = Southern Coastal Corridor, SEA = Southeast Asia, SOM = Senior Officials' Meeting , TA = technical assistance, TBD = to be determined, TEU = twenty-foot equivalent unit,.

Sources: ADB Southeast Asia Department RIF 2013; ADB South Asia Department info; various ADB TA projects; author estimates.