Preliminary Feasibility Study on Railway Coal Transportation in Kalimantan, Indonesia

Yoshimitsu MIMUROTO, Deputy General Manager
Shinzo SUGIUCHI, Senior Researcher
Coal Research Group, International Cooperation Department, IEEJ

Introduction

Reflecting the growing coal demand in the Asia Pacific region, Indonesia's coal production increased from 10.50 million tons in 1990 to 76.44 million tons in 2000. Indonesia has now become one of the world's leading coal suppliers after Australia and China, and its coal output is likely to reach 183.30 million tons by 2020 as a result of the increased coal demand expected from domestic power plants and other Asian economies. From the Japanese perspective, too, Indonesia's coal trends constitute a matter of great concern since, following Australia and China, Indonesia is now the third largest coal supplier to Japan with Indonesian coal imports up from 940,000 tons in 1990 to 14.41 million tons in 2000.

At present, Indonesia is producing coal in Sumatra and Kalimantan (Borneo Island). In Kalimantan, where railways are non-existent, the principal means of moving coal are trucks and barges. Given that in future newly developed mines will be located deeper in the hinterland than the existing mines, i.e. in areas where barges cannot be used, the new mines will need a new coal transportation system.

In this study, we have proposed three scenarios for Kalimantan's coal transportation in the future and examined which scenario offers the best solution in economic terms. The three scenarios are:

(1) Scenario 1: Existing transportation system using trucks and barges

(2) Scenario 2: Existing truck-and-barge system plus new railway

(3) Scenario 3: Existing truck-and-barge system plus railway minus offshore transshipment (offshore loading)

1. Coal Supply and Demand in Indonesia

(1) Current of coal production, domestic demand and exports

Indonesia's coal output has been increasing sharply since 1981 when a contractor system was introduced, allowing the use of foreign capital. Coal production, a mere 340,000 tons in 1980, exceeded 10.00 million tons in 1990 and by 2000 had reached a remarkable 76.40 million tons.

At present, Indonesia exports about 75% of its coal output, shipping the remaining 25% or so to domestic markets. The major consuming sectors at home are the power and cement industries, accounting for 65.6% and 17.9% of domestic coal demand, respectively. The remainder is shared among other sectors such as paper/pulp.

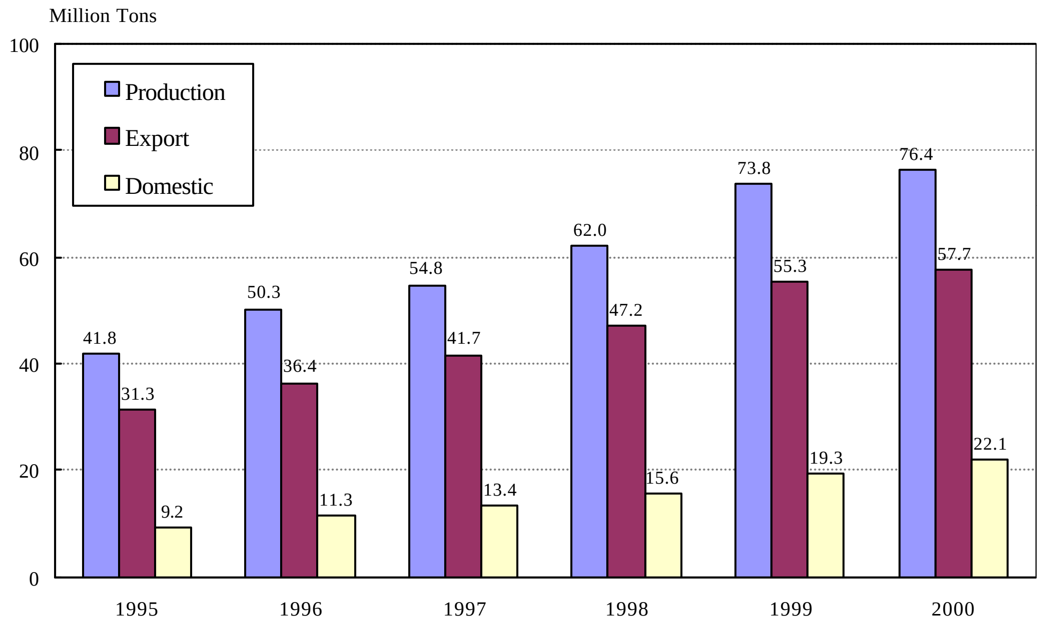

Fig. 1 Indonesia's Coal Production, Exports and Domestic Demand

Source: Directorate of Coal, "Indonesian Coal Yearly Statistics, Special Edition 1997-2000"

2000 data furnished by the Directorate of Coal, February 2001.

In 2000 Indonesia exported 57.69 million tons, up 3.5% over the previous year. Of this, 13.70 million tons (23.7% of the whole) went to Japan, 12.84 million tons (22.3%) to Taiwan, and 4.90 million tons (8.5%) to Korea. Combined exports to the three major destinations of Japan, Taiwan and Korea totaled some 31.40 million tons, or about 55% of the whole. Fig. 1 shows Indonesia's coal supply and demand.

(2) Coal demand Outlook

We forecast the domestic coal demand in reference to coal demand forecast data furnished by PLN (National Electric Power Corporation), the Cement Association and BPPT (Science and Technology Assessment and Application Agency). Coal exports were predicted to increase by 2.5%/year from 55.30 million tons in 1999 to 89.00 million tons in 2020. Indonesia's coal demand outlook is shown in Table 1.

(3) Kalimantan coal supply Outlook

Table 2 presents the Kalimantan coal supply outlook. This outlook is based on the prediction that coal output from Sumatra will not increase much and that Kalimantan will become the center of Indonesian coal production.

Table 1 Outlook for Indonesia's Coal Demand

(Unit: Million tons)

Year	Domestic				Export	Total
	Electricity	Cement	Others	Total		
1998	10.6	1.3	3.5	15.4	47.2	62.6
1999	13.6	2.0	3.7	19.3	55.3	74.6
2000	15.2	3.2	3.0	21.4	56.0	77.4
2005	27.8	4.5	3.8	36.1	73.5	109.6
2010	39.1	5.7	4.8	49.6	81.7	131.3
2015	55.1	7.2	6.0	68.3	86.0	154.3
2020	77.6	9.1	7.6	94.3	89.0	183.3

Source: Actual data up to 1999; Directorate of Coal, "Indonesian Coal Yearly Statistics" ,2000
Outlook for 2000 onward: Forecast by IEEJ.

Table 2 Outlook for Kalimantan Coal Supply

(Unit: Million tons)

	1998	1999	2000	2005	2010	2015	2020
Production	49.7	60.3	63.0	96.6	118.3	141.3	170.3
Domestic use	6.3	9.3	12.9	26.1	39.6	58.3	84.3
Exports	43.4	51.0	50.1	70.5	78.7	83.0	86.0

Source: Actual data up to 1999; Directorate of Coal, "Indonesian Coal Yearly Statistics," 2000
Outlook for 2000 onward: Forecast by IEEJ.

2. Coal Industry in Kalimantan

(1) Coal reserves

The Directorate of Coal, the Ministry of Mines and Energy, puts Indonesia's coal reserves at 38.9 billion tons. Of this, some 54%, or about 21 billion tons, is located in Kalimantan. Of these 21 billion tons, 6.6 billion tons are measured reserves, and 2.5 billion tons are mineable reserves.

Table 3 Indonesian Coal Reserves by Area

(Unit: Million tons)

	Reserves			
	Mineable	Measured	Indicated*	Total
Sumatra	2,825	4,258	9,015	13,273
Java	0	1	5	6
Kalimantan	2,505	6,640	14,573	21,213
Others	38	670	3,713	4,383
Total	5,368	11,569	27,306	38,875

Note: Indicated reserves include inferred ones.

Source: DOC, "Indonesian Coal Statistics", 2000

(2) Present coal production

Of the 76.44 million tons of Indonesian coals produced in 2000, 64.69 million tons came from Kalimantan, accounting for about 85% of nationwide output. There are 14 contractors in Kalimantan, producing coals under production-sharing agreements with the government. Nine of these are First-generation contractors and five are Second-generation. Among the others, four KP holders (small-scale concession holders) and KUD (regional cooperatives) are engaged in coal production.

Table 4 Coal Production Kalimantan

(Unit: 1,000 tons)

	1997	1998	1999	2000
South Kalimantan				
PT Adaro Indonesia	9,352	10,930	13,601	15,481
PT Arutmin Indonesia	6,529	6,326	8,653	8,174
PT Bahari Cakrawala Sebuku	0	1,195	1,549	1,483
PT Bentala Coal Mining	0	230	189	166
PT Jorong Barutama Greston	0	192	714	1,190
KUDs	177	271	257	54
East Kalimantan				
PT Berau Coal	1,872	2,252	3,261	4,877
PT BHP Kendilo Coal Ind.	773	972	1,027	1,080
PT Indominco Mandiri	1,198	1,984	3,058	3,467
PT Kaltim Prima Coal	12,899	14,691	13,974	13,099
PT Kideco Jaya Agung	4,028	5,004	7,302	8,038
PT Multi Harapan Utama	1,634	1,277	1,644	1,221
PT Tanito Harum	1,225	1,024	1,011	1,046
PT Gunung Bayan Pratama	-	-	1,048	1,345
PT Bukit Baiduri Enterprise	1,330	1,612	1,752	1,994
PT Fajar Bumi Sakti	431	249	187	155
PT Kitadin Corporation	957	1,098	865	826
Total	42,461	49,692	60,335	64,690

Source: Directorate of Coal, 2000

(3) Possibilities of new development

From now on, Second- and Third-generation contractors are expected to become the principal developers of new mines. In Kalimantan, there are 13 Second-generation contractors—domestic firms having contracts with the government under the Presidential Decree No. 21 issued in 1993. These contractors signed Coal Cooperation Contracts (CCC) in August 1994. Five of the 13 contractors are currently in operation: they are PT Antang Gunung Meratus, PT Bahari Cakrawala Sebuku, PT Bentala Coal Mining, Pt Jorong Batutama Greston and PT Gunung Bayan Pratama. The remaining eight contractors are at either the construction stage or the construction-preparatory stage, and likely to start production during the period 2001 – 2003.

Third-generation are either domestic firms or foreign capital that signed Coal Contracts of Work (CCoW) under the Presidential Decree No. 75 issued in 1996. 60 Third-generation contractors are currently active in Kalimantan. However, aside from PT Lanna Harita Indonesia (under construction) and PT Lianganggang Cemerlang (at the F/S stage), the remaining 58 contractors are at

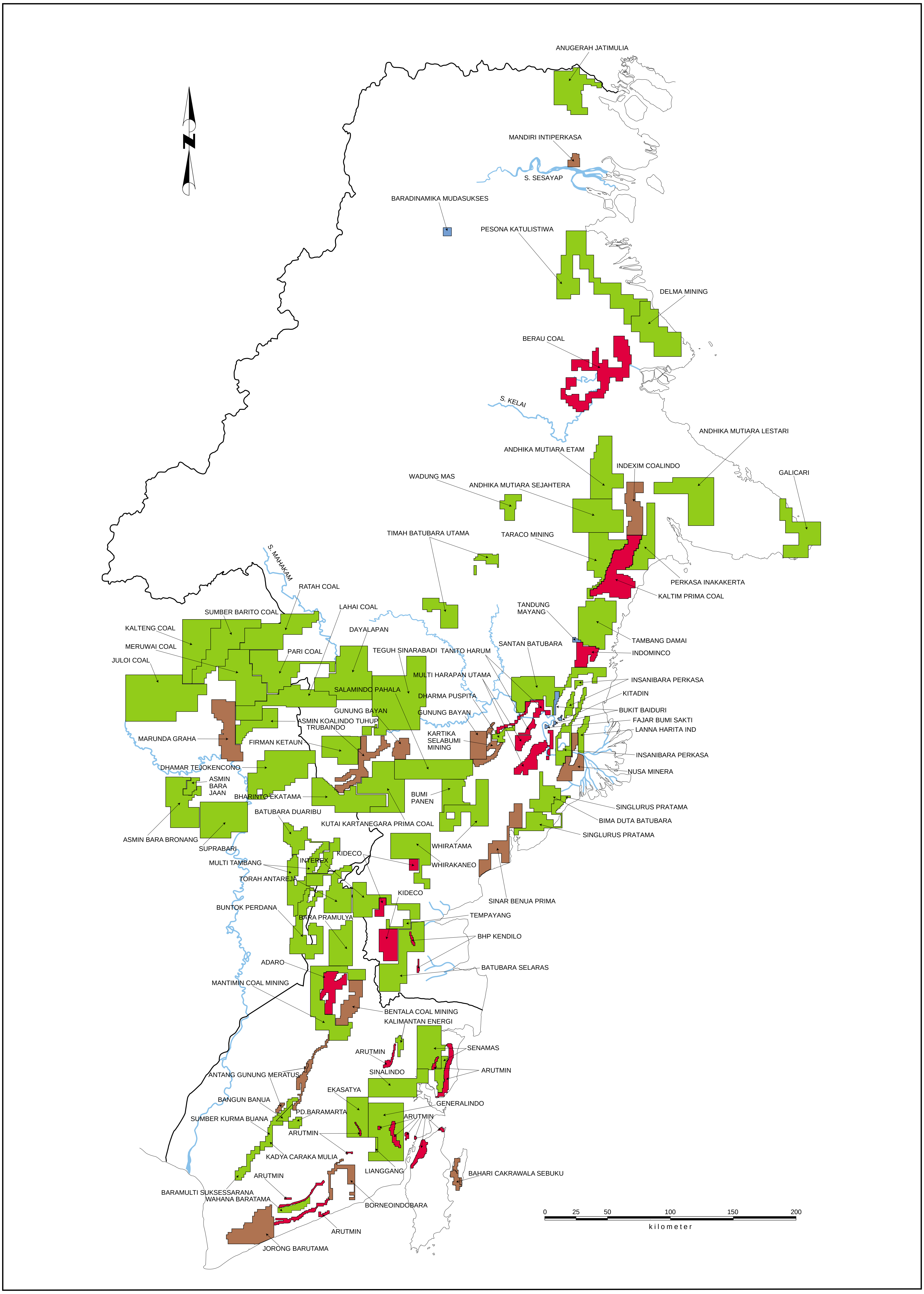

Fig.2 Coal Concession Area in Kalimantan

either the general-examination or the prospecting stage. While it is expected that a few of Third-generation will be able to start production by 2002, many of them are afraid that their production will not begin before 2005 owing to sluggish coal demand and short investment funds. Fig. 2 shows coal concessions in Kalimantan.

3. Coal Quality and Marketability

(1) Coal quality

We examined Kalimantan coal qualities by basin. The Tarakan Basin in the northern part of East Kalimantan contains coals with a calorific value of 5,700 – 6,000 kcal/kg (adb), while coals in the Kutai Basin, particularly Salmaind, have a relatively high calorific value of 5,800 – 7,100 kcal/kg (adb). Coals in the Pasir Basin, spreading through the coastal area of South Kalimantan, have a rather low calorific value of 4,300 – 6,800 kcal/kg (adb). Coals in the inland Barito Basin show a wide range of calorific values from a low 4,800 kcal/kg (adb) to a high 7,000 kcal/kg (adb).

By use, most of Kalimantan's coals are categorized as steaming coal, although the coal seams in the Barito Basin also contain coking coal deposits.

PT Adaro Indonesia in South Kalimantan, PT Kideco Jaya Agung in East Kalimantan, and PT Dhamar in Central Kalimantan, among others, are expected to yield low-sulfur coals under 0.3% (adb). Others having coal deposits that show coking-coal characteristics include PT Marunda Graha Mineral in Central Kalimantan.

Table 5 Principal Coal Qualities by Basin

Basin	Location	Coal qualities (adb)				
		IM (%)	Ash (%)	VM (%)	CV (kcal/kg)	TS (%)
Tarakan	Northeastern part, East Kalimantan	15	4	38	5,700 - 6,000	0.1
Kutai	Central eastern part, East Kalimantan	3 - 15	0.3 - 8	37 - 42	5,800 - 7,100	0.1 - 1
Pasir	Coastal areas of East & South Kalimantan	4 - 29	1 - 18	37 - 42	4,300 - 6,800	0.1 - 1
Barito	Central part of South Kalimantan – Eastern part of Central Kalimantan	4 - 28	1 - 20	39 - 45	4,800 - 7,000	0.1 - 2

(2) Marketability

The Japanese power industry consumed almost a million tons of subbituminous coal in 2000, which is still far less than its bituminous coal consumption. However, in view of economics, coal rank diversification and environmental advantages, the introduction of a growing amount of subbituminous coal seems very likely in the future.

Taiwan Electric Company is ahead of Japanese utilities in the introduction of subbituminous coal. In Taiwan, environmental standards have become stricter year by year in reflection of mounting concerns over environmental problems, and this has boosted demand for low-sulfur subbituminous coal. Of Taiwan's total coal imports of 23.00 million tons in 1999, subbituminous coal amounted to 6.50 million tons (about 28% of the whole). Korea, where environmental standards are also becoming more stringent than ever, imported 4.60 million tons of subbituminous coal in 2000. Moreover, given the likelihood of price competitiveness becoming an important factor in fuel procurement once Korea Electric Power Corporation is privatized, Korea's demand for subbituminous coal may increase if cost competitiveness is found in equivalent heat quantity terms.

From now on, Japan, Taiwan and Korea are all likely to show a growing demand for Indonesian subbituminous coal not merely for environmental reasons but also as a result of their efforts to diversify acceptable coal ranks and pursue better economics. Accordingly, coals dormant in untapped concession areas in Kalimantan may well be exported to East Asia, provided only that their cost competitiveness and coal qualities can satisfy consumers' needs.

4. Infrastructure of Coal Transportation

(1) Present situation of coal transportation

In Kalimantan, where no railways exist, inland coal transportation is conducted by trucks and barges. Of 18 mines currently in operation, KPC and Indominco have captive coal terminals, but the remaining 16 mines have to move coal by trucks and barges from their mines to an offshore loading point or a coal terminal for transshipment. In the case of KPC and Indominco, coals are forwarded to the captive coal terminals by truck and belt conveyor, respectively (Fig. 3).

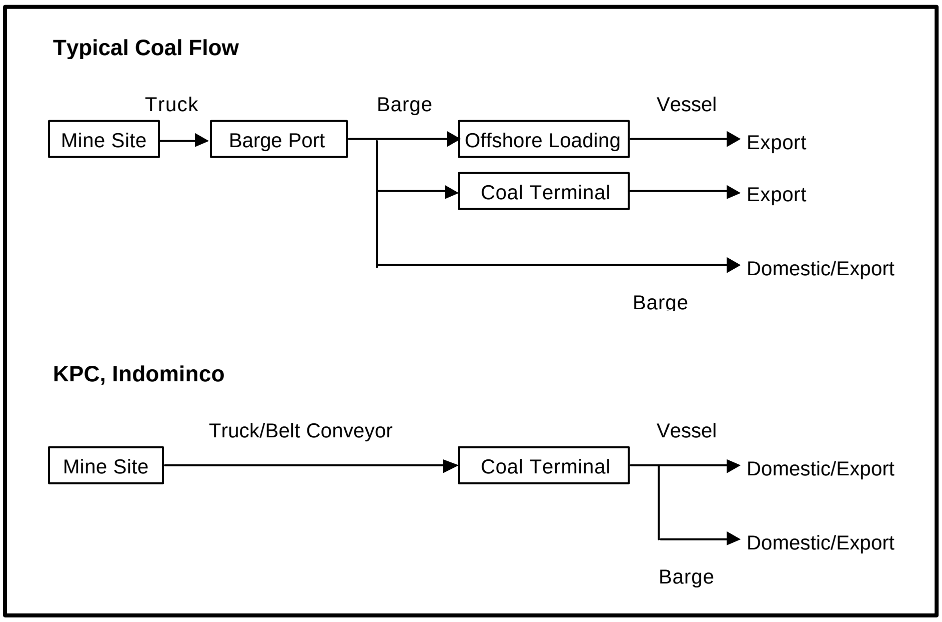

Fig. 3 Coal Transport Systems in Kalimantan

At present there are three private and two public coal terminals in Kalimantan. The former are Tanjung Bara Coal Terminal of KPC, Bontang Coal Terminal of Indominco and North Pulau Laut Coal Terminal owned by Arutmin, while the latter are Balikpapan Coal Terminal (BPCT) and Indonesian Bulk Terminal (IBT). Though once used intensively by PT Multi Harapan Utama and other coal producers located along the Mahakam River, BPCT currently has only two users, Gunung Bayan and Kideco mines. The other public terminal, IBT, is also used only by Adaro, and it hopes that newly developed mines in South Kalimantan will become its users. However, since IBT is not capable of accommodating all types of vessels, loading work of Cape Size vessels and small ships is carried out at an offshore loading point near the mouth of the Barito River.

In case of the mines not using a coal terminal, coal is transshipped from a barge to a coal vessel at a loading point provided offshore. However, this offshore transshipment to coal vessels has a poor loading capacity because coal is loaded using the coal vessel's own loading gear. And without such gear, coal vessels over Panamax Size cannot be accepted. For these reasons, Berau and Adaro introduced floating cranes, which have increased the transshipping capacity and allow accommodation of large vessels. Some mines also employ large-capacity grabs of their own in transshipment work. Kideco for its part is using a Cape Size vessel with gear, that is owned by a Korean shipping company and used exclusively as a coal vessel for shipments to Korea.

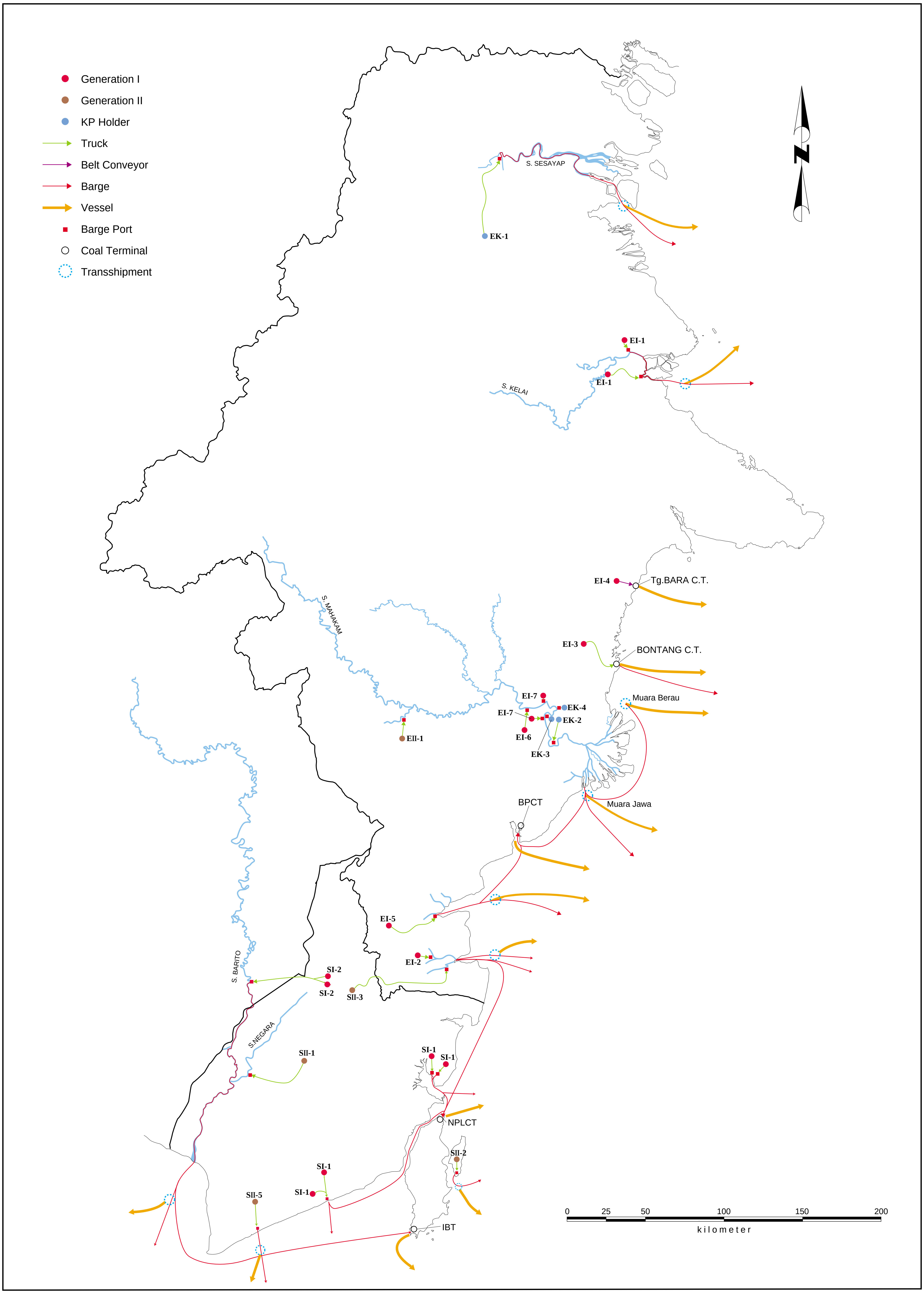

Fig.4 Current Coal Flow in Kalimantan

5. Consideration regarding Optimal Coal Transportation Route

Using an LP (liner programming) model, we determined the coal transportation route that could best maximize earnings of individual mines in Kalimantan as a whole.

Production and transportation costs incurred by new mines were estimated from survey results of the currently operating mines in Kalimantan. In addition to the existing truck & barge system, railway transportation was also assumed. In conducting the analysis, we prepared three scenarios for the coal transportation route and then calculated which one would realize maximum earnings. We analyzed the outcomes based on the various proposals for construction of railways and coal terminals.

(1) Assumptions of coal supply, costs and prices

Tables 6 – 10 show our assumptions of Kalimantan coal output, production costs, and coal prices used in running the model.

Table 6 Outlook for Kalimantan Coal Supply (Unit: Million tons)

	Domestic	Exports	Total
2005	26.1	70.5	96.6
2010	39.6	78.7	118.3
2015	58.3	83.0	141.3
2020	84.3	86.0	170.3

Table 7 Production Costs

Stripping cost	US$ 1.20/BCM
Mining cost	US$ 1.40/ton
Crushing cost	US$ 0.04/ton
Labor cost	US$ 3.00/ton

Table 8 Transportation Costs

Truck	US$ 0.07/ton-km
Barge	US$ 0.005 - 0.01/ton-km
Railway	US$ 0.020 - 0.023/ton-km
Belt conveyor	US$ 0.015/ton-km

Table 9 Loading Costs

Barge	US$ 0.75/t
Rail	US$ 0.75/t
Transshipment	US$ 1.80/t
Coal terminal	US$ 2.25/t

Table 10 Coal Prices

Export coal price	US$25/t (FOB, in terms of 5,900 kcal/kg equivalent)
Domestic coal price	US$ 20/t (CIF at Tg. Jati, in terms of 5,200 kcal/kg equivalent)

(2) Transport route setting (scenario setting)

To find an optimal coal transport route, we prepared three scenarios: one with the existing truck-and-barge system and the other two with a combination of the existing system and railway transportation. By running an LP model, we simulated which of the three scenarios was likely to bring about maximum earnings. We also simulated which mines should use which transportation systems in order to gain maximum earnings. The three scenarios are:

Scenario 1: Existing transport system

This scenario assumes land transportation by truck, with belt conveyors used by some of the existing mines. River transportation involves use of barges, from which coals are transshipped to a coal vessel at a barge port such as BPCT, KPC, BCT, NPLCT, or at an offshore loading point.

Scenario 2: Existing system + extension of existing CT + newly built CT + newly installed railway.

This scenario assumes land transportation by railway, in addition to use of trucks, belt conveyors and barges. It also assumes extension of the existing coal terminals of BPCT, KPC, BCT and NPLCT, and construction of new terminals at Tarakan, Tg. Sengatta, BPCT II and Mangkapadie.

Scenario 3: Scenario 2 without offshore loading

This scenario was prepared on the assumption that offshore loading will be banned in the future under the International Marine Organization (IMO) rules*. This is a variation of Scenario 2, whereby coals moved by the same transportation systems as in Scenario 2 are loaded at a coal terminal instead of transshipment at an offshore loading point.

(3) Transportation system setting

We prepared three cases of transportation system employed in the scenarios simulated with an LP model. These are:

Case 1: Truck-and-barge system, with offshore loading

Case 2: Truck-and-barge system, via coal terminal

Case 3: Railway system

Case 1 features the transportation system currently in use. Exportable coals from the existing mines are moved using the same system as now, while those from new mines are loaded offshore. Coals being shipped to domestic markets are delivered to consumers by barge. Case 2 also employs the current transportation system, but all exportable coals, from existing and new mines alike, are shipped via a coal terminal. Coals bound for domestic markets are delivered to consumers by barge. Case 3 involves railway construction, and coals for both export and domestic markets are moved by rail to a coal terminal, where they are loaded onto carriers to their destinations.

(4) Assumption of new coal terminals

Five coal terminals already exist, namely the BPCT, BCT and Tanjung Bara Coal Terminal (Tg. Bara CT) in East Kalimantan, and NPLCT and IBT in South Kalimantan. However,

---

*The International Marine Organization (IMO) publishes the Codes of International Dangerous Matters (IMDG Codes): Coal falls in the category of Fourth-Class Dangerous Matters (dangerous matters having a risk of spontaneous combustion if left as they are). For this reason, loading work must be done at a terminal or a berth designed for that purpose.

BCT, Tg. Bara CT and NPLCT are for the private use of Indominco, KPC and Arutmin, respectively, so only two—BPTC in East Kalimantan and IBT in South Kalimantan—are available for public use.

Of the three cases envisaged as transportation routes, Cases 2 and 3 involve a coal terminal. These cases require extension of the two public coal terminals and construction of new terminals. Judging from the distribution of coal concessions, we assumed that four new coal terminals would be built in addition to the public coal terminal extension. Candidate sites for new coal terminal construction were selected from among those situated near the shoreline and having sufficient depth of water to accommodate large coal vessels over Panamax Size.

(5) New railway route setting

Judging from the distribution of concessions and topography of Kalimantan, we assumed two railway lines, of which one runs north – south along the shoreline and the other, dedicated for inland mines, runs virtually along the Mahakam River and the Barito River (Fig.5).

Meanwhile, interconnection with NPLCT and IBT, both located in Raut, would require a railway bridge to be constructed across the Strait of Raut. Therefore, we assumed an approximately 5 km-long railway bridge to be built at Baturutin, the southernmost point, at which the strait to Raut Island is at its narrowest.

(6) Simulation results

By running an LP model, we simulated the three scenarios to determine which mines would yield maximum earnings at what coal output and with which transportation system. As shown in Fig. 6, an evaluation of Kalimantan as a whole reveals that earnings increase in the following order.

Scenario 2 > Scenario 3 > Scenario 1

Based on the calculation results of Scenario 2, Table 10 shows the mines that are expected to supply coals by railway as of 2020. Fig. 7 illustrates the railway routes and shipping ports that would be used by these mines.

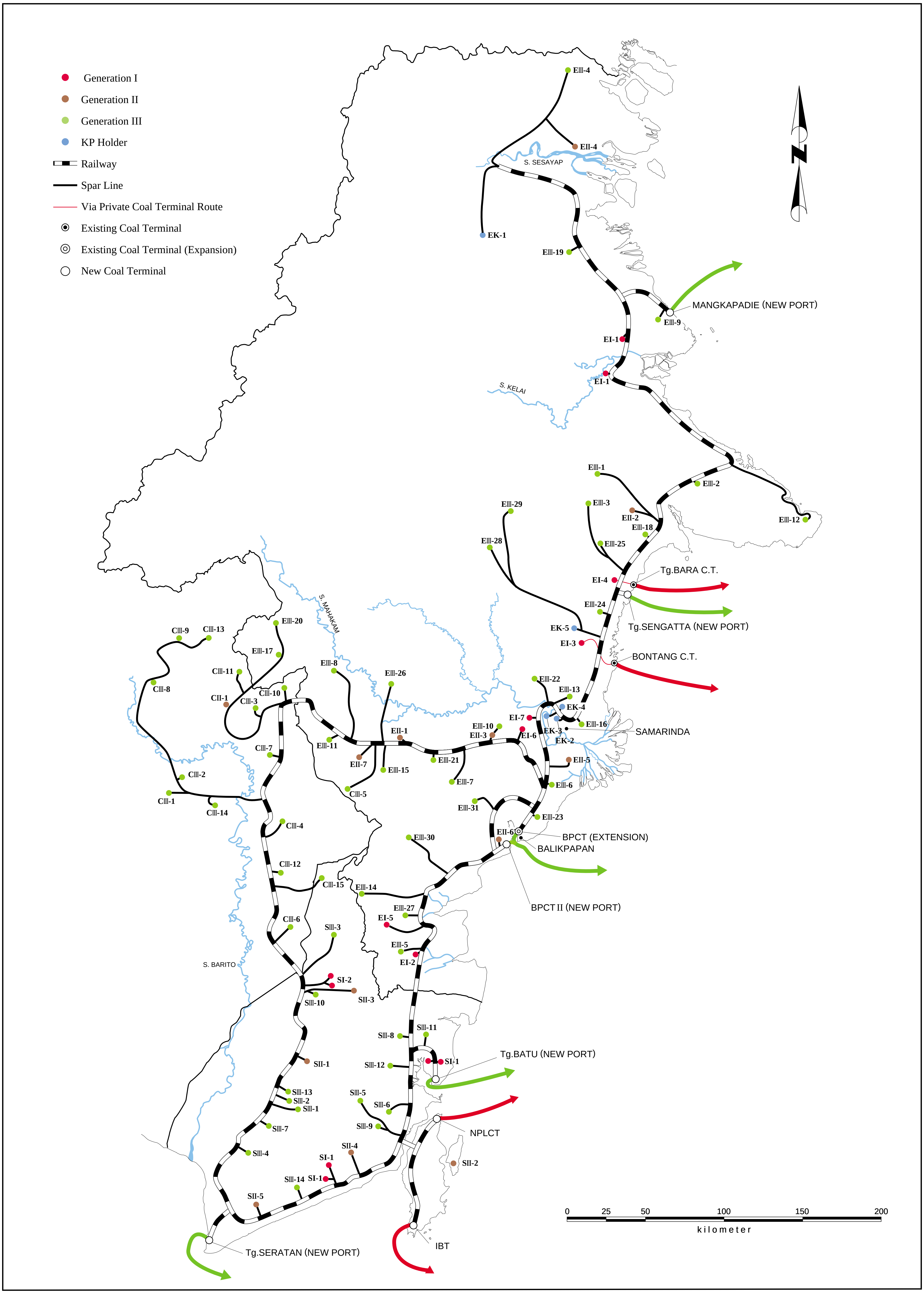

Fig.5 Coal Transportation Routes by Railways and New Coal Terminals

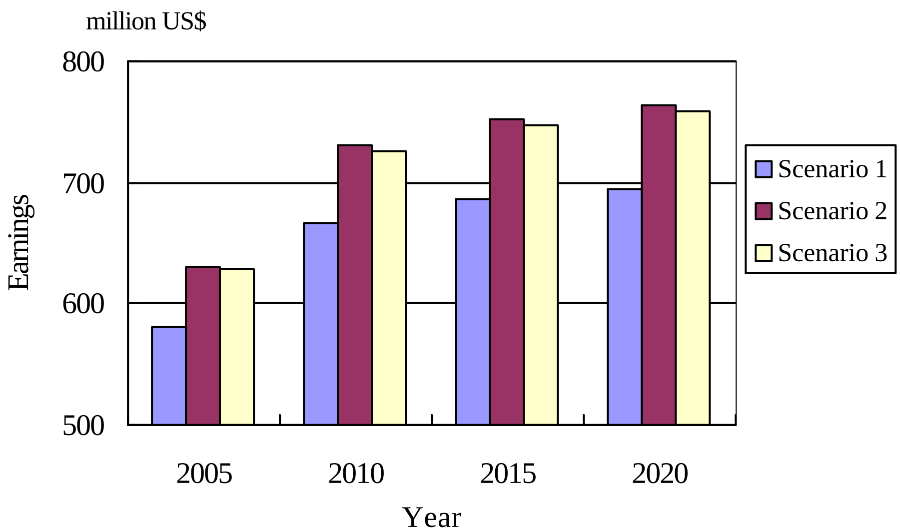

Fig. 6 Comparison of Earnings by Scenario

6. Conclusions

The conclusion we draw from our study is that maximum earnings could be realized when these railways are constructed and coals are produced from the mines adjacent to the railways. When combined, the six railway lines are expected to carry 52.70 million tons of coal, measure 1,240 km in total length, and involve an estimated $1.7 billion of total capital outlay. The next step must be to conduct a detailed feasibility study focusing on these railway lines. In short, railway transportation can be seen as a viable future option for Kalimantan coal development.

Need for Additional Studies, and Acknowledgements

Briefings of our study were held on three occasions, the first in 1999 in Jakarta, the second in 2000 in Balikpapan, and the third in 2001 in Jakarta, and were attended by many participants. Our study has attracted particularly keen attention from the Indonesian side, which perhaps reflects the serious desire for railway construction among coal-related people in Indonesia. To realize their wishes, we intend to continue our support to the greatest degree possible. In project progress terms, our study is still only at the preliminary feasibility study stage. At the next stage, detailed studies and F/S must be made in the promising areas identified in our study. We believe implementation of the next-stage studies, which are likely to take 3 – 4 years, can be supported by the Japan International Cooperation Agency, the Asian Development Bank and the World Bank.

This study report was based on a revised version of part of The Study for Coal Transportation System in Kalimantan, Indonesia. The study awarded to IEEJ by the New Energy and Industrial Technology Development Organization (NEDO) and jointly conducted by IEEJ and Directorate of Coal (currently DMCE). We are deeply grateful to the NEDO for their kind permission to use this publication. Acknowledgements are also due to our Indonesian counterparts, the Directorate General of Geology, Minerals and Resources (DGGMR) and the Directorate of Minerals and Coal Enterprises (DMCE), as well as state governments and coal-related firms in Kalimantan for their efficient cooperation in our field surveys. Lastly, we are greatly indebted to Tomoyuki Inoue, Shinji Omoteyama, Atsuo Sagawa, Tetsuya Fukushima (presently at Mitsubishi Materials Corp.) and Yasunori Yamamoto (presently at Center for Coal Utilization, Japan), who conducted the study at the International Cooperation Department, IEEJ.

Table 11 Data for Economic Analysis by Line

Name of Railway Line Name of Coal Mine		Production 1,000t	Branch line km	Main line km	Total km	Investment $1,000	OM cost $1000/year	Tariff $/t
Mangkapadie Line								
EK-1	Baradinamika Mudasukses	1,000	60	215	275		1,285	6.22
EI-1	Berau Coal (Binunngan)	3,000	10	110	120		1,956	2.62
EI-1	Berau Coal (Lati)	3,000	0	85	85		1,808	1.82
	Total	7,000	70	285	355	264,773	5,050	
Sengatta Line								
EII-2	Indexim Coalindo	1,600	20	90	110		985	2.45
EIII-18	Perkasa Inakakerta	1,000	0	60	60		375	1.33
EIII-3	Andhika Mutiara Sejahtera	1,000	55	30	85		480	1.90
EIII-25	Taraco Mining	1,000	25	30	55		353	1.22
EIII-24	Tambang Damai	1,000	10	25	35		269	0.77
EIII-28	Timah Batubara Utama	1,000	125	40	165		819	3.72
EK-5	Kitadin Tandung Mayang	600	25	40	65		130	1.46
	Total	7,200	220	120	340	283,712	3,411	
Mahakam Line								
EIII-22	Santan Batubara	1,000	20	115	135		692	3.04
EIII-6	Bima Duta Batubara Sakti	1,000	0	45	45		311	0.99
EI-6	Multi Harapan Utama	2,500	15	80	95		1,519	2.07
EIII-10	Dharma Puspita Mining	1,000	10	100	110		586	2.47
EII-3	Kartika Selabumi Mining	1,000	5	100	105		565	2.36
EIII-21	Salamindo Pahala	1,000	10	145	155		777	3.49
EII-1	Gunung Bayan Pratama	4,000	0	175	175		2,853	3.83
EIII-15	Kutai Kartanegara Prima Coal	1,000	25	190	215		1,031	4.85
CIII-5	Bharinto Ekatama	1,000	50	195	245		1,158	5.53
EII-7	Trubaindo Coal Mining	1,500	15	200	215		1,363	4.83
CIII-10	Lahai Coal	1,000	15	285	300		1,391	6.78
	Total	16,000	160	365	525	476,892	12,245	
South Balikpapan Line								
EI-5	Kideco Jaya Agung	10,000	25	110	135		6,668	2.68
EIII-27	Tempayang Cemerlang	1,000	10	100	110		586	2.47
EIII-14	Interex Sacra Raya	1,000	55	80	135		692	3.04
EIII-30	Whirakaneo Coalindo	1,000	45	65	110		586	2.47
EIII-31	Whiratama Bina Perkasa	1,000	15	55	70		417	1.56
EII-6	Sinar Benua Prima	1,000	5	15	20		205	0.43
	Total	15,000	155	145	300	358,455	9,154	
Selatan Line								
SII-1	Antang Gunung Meratus	2,000	10	170	180		1,547	4.02
SIII-1	Baramarta	500	20	145	165		487	3.74
SIII-7	Kadya Caraka Mulia	1,000	5	125	130		671	2.92
SIII-4	Baramulti Suksessarana	1,000	10	95	105		565	2.36
	Total	4,500	45	170	215	195,562	3,270	
Batu Line								
SIII-5	Ekasatya Yanatama	1,000	50	125	175		861	3.95
SIII-8	Kalimantan Energi Lestari	1,000	5	75	80		459	1.79
SIII-11	Senamas Energindo Mulia	1,000	10	25	35		269	0.77
	Total	3,000	65	155	220	164,698	1,589	
Grand Total		52,700	715	1,240	1,955	1,744,092	34,719	

(Note) Due to overlapping of some railways, adding up railway distances does not accord with the total of railway distances of individual mines.

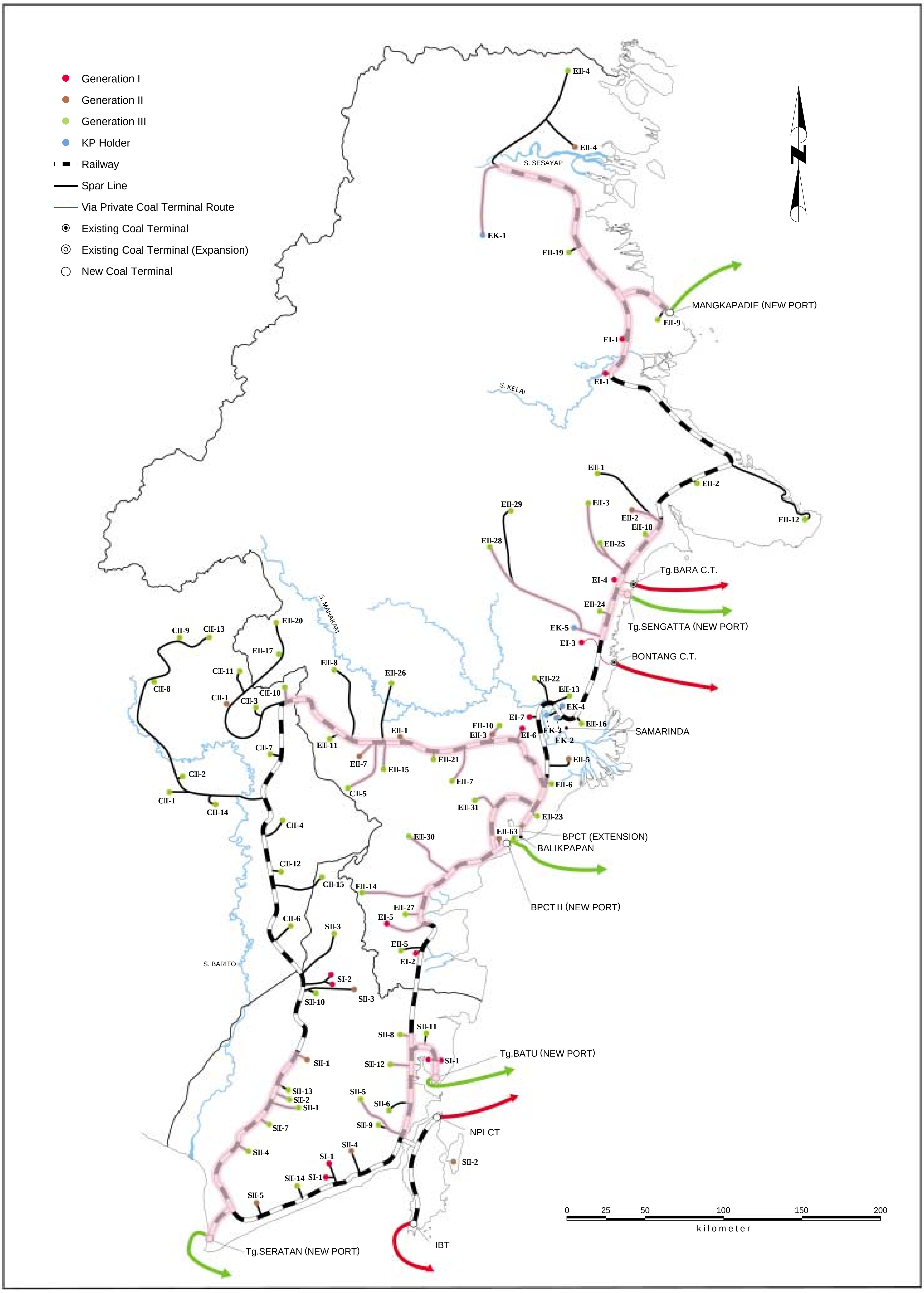

Fig. 7 Proposed Coal Transportation by Railway