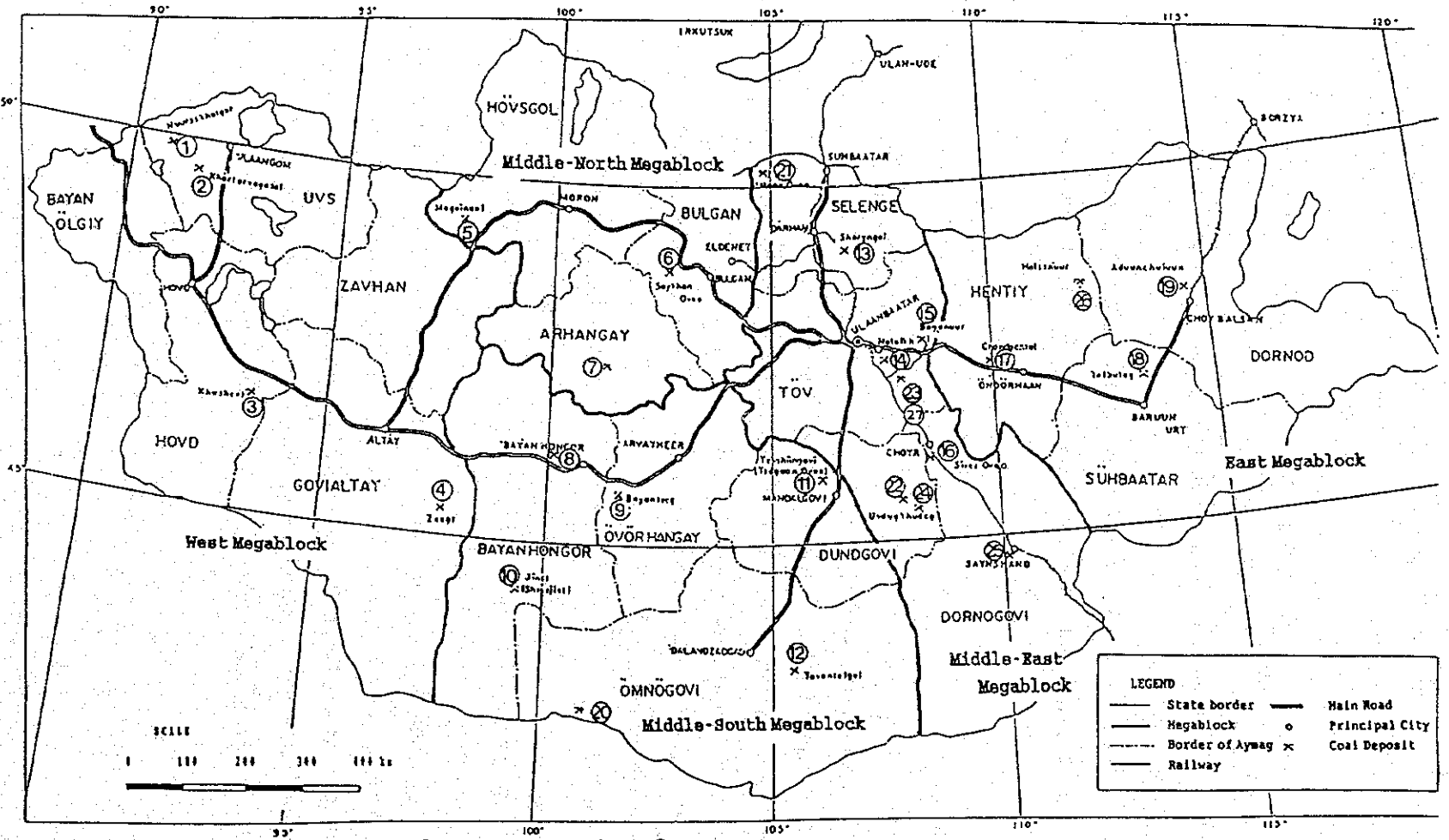
8.5 Human resources development

- It is important to educate manpower such as administrative officials, business managers, engineers and technicians to promote rational production and use including energy conservation.
- First thing to be done is to educate engineers and technicians to be able to repair equipment. Establishment of a training center is advised in Section 7.1.5.
- Secondly important matter is to educate administrative officials and business managers to learn know-how of the market economy.
- ODA from developed countries should be positively used to dispatch trainees, to invite instructors and to purchase necessary machines for research and development as well as training.

8.6 Coal quality control plan

- Recently, low quality coal supplied from Shivee Ovoo and Baganuur coal mines causes heavy operation troubles in power plants, cement plants, etc.
  To prevent such troubles, the overall coal quality control plan is proposed.
- Major claims by coal users are; low calorific value by high moisture content and oxidized coal, lump sized coal, contamination with rocks and metals, etc.
- Above-mentioned claims could be resolved by introduction of quality control mind and facilities into the coal mines and the coal using plants.
- Coal quality upgrading by the washing process is not economical, because the effectiveness of washing is low for lignite and moisture content becomes larger during the washing process.
- Coal mines should manage the coal quality by installing analyzers, detectors, dewatering facilities, etc as well as an organization for quality control.
- It is important to redesign and modify the existing coal-fired boilers to fire the coal with quality of lignites, which are being extracted currently and will be extracted from designed deposits.
- Power plants in Ulaanbaatar should modify the coal feeding system (drying and crushing) and the modification of boilers would be considered on the basis of Mongolian coal standard of Baganuur coal and Shivee Ovoo coal because their calorific values are 20-30% lower than the design value.



① Nuursthotgor Deposit
② Khartarvagatai Deposit
③ Khusheet Deposit
④ Zeegt Deposit
⑤ Mogoingol Deposit
⑥ Saihan-Ovoo Deposit
⑦ Bayantsagaan Deposit
⑧ Uburchuluut Deposit
⑨ Bayanteeg Deposit
⑩ Shinjinst Deposit
⑪ Tevshiingovi Deposit
⑫ Tavantologoi Deposit
⑬ Sharyngol Deposit
⑭ Nalaykha Deposit
⑮ Baganuur Deposit
⑯ Shivee-Ovoo Deposit
⑰ Chandagantal Deposit
⑱ Talbulag Deposit
⑲ Aduunchuluun Deposit
⑳ Narynsohait Deposit
㉑ Ulaan-Ovoo Deposit
㉒ Khoot Deposit
㉓ Tsaidamnuur Deposit
㉔ Ovdok-Huduk Deposit
㉕ Sainshand Deposit
㉖ Hulstnuur Deposit
㉗ Tugrugnuur Deposit

Figure 4 Main Coal Deposits in Mongolia

Table 11 Main Coal Deposit in Mongolia (1/2)

Coal Deposit	Age	Geological Structure Basics	Strike	Dip	Mineable Coal Seams Number	Thickness	Characteristic	Classification of Coal Mongolia (Russia)	ASTM (U.S.A.)	JIS (Japan)	Moisture (arc) %	(ad) %	Ash (d) %	Vol. (daf) %	S (d) %	Calorific Value (arc) kcal/kg	(daf) kcal/kg
(1) Nuurstkotgor Deposit	C2-C3	basin	NS (west) EW (north)	45° E (west) 5-25° W (east)	8	2-50m	variable thickness, no coal (south)	D-G	SB(B)-HV(C)	E-C	1.4-2.1	0.7-0.8	19-36	31-44	0.3-0.5	4,100-5,000	7,560-8,430
(2) Khartarvagatai Deposit	C2-C3	fold with faulting	NE	30-40° (west wing) 50-70° (east wing)	1	80-85m	few parings (0.1-0.2m, 2-4 beds)	D-G	SB(B)-HV(C)	E	16.0	3-5	15-25	40-45	0.5	5,500	7,450
(3) Khusheet Deposit	C2-C3	syncline	NS	45° (west wing) 50-65° (east wing)	2	15.5-34.9m	outcropped (no capping)	D-G	SB(B)-HV(C)	E-B1	7.0	3-4	33130	20-27	0.5	5,400-6,300	8,590
(4) Zeegt deposit	C2-C3	fold with faulting	NW	0-40°	1	9-16m	many partings, variable thickness	J	HV (A)	E-C	10.0	0.2-13.3	18.4	30-34	0.4	4,880	8,200
(5) Mogoingol Deposit	C 3	basin	NS EW (north)	6-12°	1	2-20m av. 7-8m	variable thickness,	J	SB(B)-HV(C)	E-C	6.5	5-6	18.0	34.6	0.9	5,300-5,600	7,350
(6) Saihan Ovoo Deposit	J 2	homocline	NS	0-3° (max 5°)	1	2-2.4m	variable thickness, basalt lava	K,KJ-A	MV-A	C-A1	4.5-7.0	0.1-12.0	21.7	10.0-46.0	0.6	6,100	7,290-8,700
(7) Bayantsagaan Deposit	J 2	homocline	NE	30°	1	10m	partings	B3	SB (B)	F-E	7.3	2.6	25.5	39.8	0.6	5,600	7,500
(8) Uburchulaat Deposit	K1	gentle syncline	NE	0-5°	1	6-8m	few partings	B2	SB(B)-HV(C)	F	30-40	10.0	6-25	43.0	< 1.0	3,500	7,000
(9) Bayanteeg Deposit	J1-J2	asymmetrical syncline	EW	18-24° (north wing) 70-85° (south wing)	1	3-36m	variable thickness, splitting	B3-D	SB(B)-SB(A)	F-E	5.2	2.2	22.6	51.9	1.0	4,680	7,230
(10) Shinjiast Deposit	J1-J2	homocline	EW	30-40° S	1-3	42-49m (east) 8-18m (west)	splitting (west)	GJ	HV (B)	C	6.1	1.0	13.1	33.8	0.6	4,500	8,310
(11) Tevshiingovi Deposit	K1	gentle syncline with faulting	EW	10-15° (surface)	5	IV: 20m I - III: max 230m	much variable thickness,splitting	B2	SB (C)	F	30.5	11.0	20.9	45.5	0.7	3,370	6,450
(12) Tavantologoi Deposit	P2	gentle syncline	NW	0-30° 0-15° (north)	12	2-72m	splitting partially coking	G-KJ	HV(C)-LV	E-B	6.9	0.1-2.5	14.9	32.8	0.8	5,,100-5,500	7,700-8,400
(13) Sharyngol Deposit	J2-J3	homocline with faulting	N60° E	6-9° SE	2	30-40m	faulting splitting	B3-D	SB(B)-SB(A)	F-E	18.0	3.0	22.0	45.0	0.6	3,900-4,200	7,200
(14) Nalaykha Deposit	K1	homocline	NW	8-19° SW	5	8-20m	variable thickness	B3	SB (B)	F	21.0	5.0	16.5	45.0	0.7	3,900	6,620
(15) Baganuur Deposit	K1	basin with faulting	NE	8-20°	3	2-98m	splitting (Seam 3)	B2	SB (C)	F	33.0	9.2	18.0	44.6	0.4	3,200-3,500	7,070
(16) Shivee Ovoo Deposit	K1	gentle basin	NW	8°	4	2-23m	splitting max depth: 350m	B2	SB (C)	F	43.6 34.5	6.0 10.4	17.3 8.7	45.7 44.0	0.9 0.5	2,690 3,610	6,660 6,700
(17) Chandagantal Deposit	K1	homocline with faulting	WNW	5-8° S	1	30-50m	parting (0.1-3.4), intrusive rock	B2	SB (C)	F	30.6	12.3	11.7	46.5	0.9	3,000-3,400	6,580
(18) Talbulag Deposit	K1	gentle basin	NE	<10° 8-15° (area II)	3	2-30m	variable thickness	B1	L (A)	F	30.0	9.5	14.0	47.0	0.8	2,850	6,000
(19) Aduunchuluun Deposit	K1	gentle basin	ENE-WNW	6-8°	2	2-50m	much variable thickness	B1	L (A)	F	45.2	9.4	16.7	48.1	1.1	2,400	6,480
(20) Narynsohait Deposit	P2	homocline	EW	15-35° S(west) 35-55° (east)	1	West I :100m East V :100m	few patrtings, intrusive rock (East b.)	GJ-A	HV (C)-A	E-A	5.0	1.0-2.8	5.0-30.0	28-40	0.4		7,500
(21) Ulaan Ovoo Deposit	J	gentle basin	EW	15-20° N, 60-70° N (west)	1	24-63m	variable thickness, many partings	B3-D	SB (B)-SB (A)	F-E	13.4	7.3	11.2	46.0	0.3	4,270	7,370
(22) Khoot Deposit	J2-J3	homocline with faulting	ENE	5-12° S	5	V :8-10m	V: few partings Others: many partings	B3-D	SB (B)-SB (A)	F-E	13.8	7.5	14.5	43.0	0.7	4,100	7,030
(23) Tsaidamnuur Deposit	K1	elongate basin with faulting	NNE	0-5°	3 groups	5-50m	variable thickness, splitting	B2	SB (C)	F	30-34	9-11	12-18	42-45	0.4-0.7	3,600-3,800	6,800-7,100
(24) Ovdok Huduk Deposit	K1	plain-syncline	NE, EW	0-5°	1	30-60m	high sulphur	B1-B2	SB (C)	F	36.0	7-9	13.9	45.0	2.8	3,070	6,300
(25) Sainshand Deposit	J	fold and faulting	n.a.	60-85°	3	1-3m	steeply dipping	G-GJ	HV (B)	E-C	2.1-7.2		6.1-25.7	16.3-29.7		5,050-6,730 (base unknown)	
(26) Hulstnuur Deposit	K1	gentle basin	EW	8-15° (max 20°)	2	VI: 9.0-32.6m V : max 9.8m	variable thickness, splitting(V)	B2	SB (C)	F	30.1	10.2	12.7	47.5	0.7	4,430 (ad base)	6,470
(27) Tugrugnuur	K1	anticline syncline	dome shape	7	2	5m 15m	few partings	B2	SB(C)	F		7.3	14.9	50.6	0.8		6,240

(Note) Above coal quality data is not the coal quality standard of Mongolia (see Table 3.5)

Table 11 Main Coal Deposit in Mongolia (2/2)

Coal Deposit	Megablock	Province (Aimag)	Sotuation	Access	Topography	Size of Deposit Extent	Area	History of Exploration First Record	Prospecting	Detailed Exploration	Coal Reserves million t. Area	Depth	Mineable (A+B+C1)	Geological (A+B+C1 +C2+P)	Mining Results Year of opening	Method	Products (1,000t)
(1) Nuurstkotgor Deposit	West	UVS	49° 40'N 90° 33'E	110km WNW of Ulaangon	Plain grassland	NS: 15.0km EW: 30.0km	450km²	1927	1941-1942 1990-1991	1960 (partially)	whole area	100m	142.3	166.6	1963	O/C	(1963-1993) 3,139.9
(2) Khartarvagatai Deposit	West	UVS	49° 35'N 91° 40'E	50km SW of Ulaangon (100km by vehicle)	mountain grassland	SWNE: 6.0Km NWSE: 2.5Km	30km²	1941	1941	1961 (partially)	NNE : 0.85km WSW : 0.4km	60-100m	19.7	25.7	1964	O/C	(1964-1993) 2,350.4
(3) Khusheet Deposit	West	HOVD	46° 40'N 93° 25'E	20km NE of Testseg, 60km SN of Darvi by vehicle	gentle hills	NS: 3.5km EW: 2.0km	7km²	1926	1967	1972(partially) 1978	NS : 0.8km EW : 0.7km	70-140m	14.7	24.3	1971	O/C	(1971-1993) 1,190.8
(4) Zeegt deposit	West	GOVAILTAI	45° 20'N 97° 50'E	9km SW of Changmani, 250km SE of Altay by vehicle	plain	NW: 2.5km NE: 1.0km	2.5km²	(ancient)	1969	1979	1.6 x 0.5km whole area	50m	2.57 4.58	6.87	1966	O/C	(1966-1993) 1,261.0
(5) Mogoingol Deposit	Middle-North	HOVSGOL	49° 20'N 97° 55'E	165km WSW of Moron	hills forest	NS: 1.0km EW: 0.4-0.6km	0.5km²	1955	1967-70	1976	NS : 1km	80-90m	4.0	15.0	1970	O/C	(1970-1993) 1,645.6
(6) Saihanm Ovoo Deposit	Middle-North	BULGAN	48° 48'N 102° 30'E	80km W of Bulgan (90km by Vehicle)	hills forest	NS: 5.0km EW: 3.5km	17.5km²	1960	1988-89	1961(West) 1977(East) 1993(North)	over 1.5m thick of coal seem	250m	23.95	34.66	1965	U/G	(1966-1993G) 521.1
(7) Bayantsagaan Deposit	Middle-North	ARHANGAY	47° 40'N 101° 18'E	25km NNW of Tsetserleg	hills grassland	SWNE: 2.5 Km NWSE: 0.5 Km	0.6 km²	1977	1986	1989	whole area	100m	1.2	5.5	1994	U/G	on preparing
(8) Uburchuluut Deposit	Middle-South	BAYANHONGOR	46° 20'N 101° 05'E	60km WNW of Bayanhongor	hills grassland	: 0.5km : 0.8km	0.4km²	1971	1978	1981	0.5 x 0.8 km	60-70m	3.7	3.7	1978	O/C	(1978) 1.2 interruption
(9) Bayanteeg Deposit	Middle-South	OVORHANGAY	45° 40'N 101° 35'E	134km SW of Arvayheer	plain grassland	NS: 1-2km EW: 7km	10km²	1961	1961 1973	1977	EW : 7km	100-110m	29.7	100	1962	O/C	(1962-1993) 4,047.3
(10) Shinjinst Deposit	Middle-South	BAYANHONGOR	44° 35'N 100° 13'E	7km NW of Shinjinst 250km SW of Bayanhongor	plain grassland	NS: 1km EW: 9km	9km²	1977	1977	1977-78 (partially)	North block	100-110m	2.4	4.1	1991	O/C	(1991-1993) 32.9
(11) Tevshiingovi Deposit	Middle-South	DUNDGOVI	46° 00'N 106° 07'E	30km N of Mandalgovi	gentle basin grassland	NS: 6km EW: 12km	72km²		1940-60	1981-82	whole area	300-350m 300-350m	587.7	960.0	1963	O/C	(1963-193) 1226.7
(12) Tavantologoi Deposit	Middle-South	OMNOGOVI	43° 35'N 106° 30'E	96km W of Dalanzadgad 540km S of Ulaanbaatar	plain grassland	NS: 6-15km EW: 60km	600km²	1890	1978-81 1984-87	1981-90	main area	300m 500m	3,500	6,500	1966	O/C	(1966-1993) 2,085.7
(13) Sharyngol Deposit	Middle-East	SELENGE	49° 12'N 106° 27'E	50km SE of Darhan by train	hills forest	NW: 1.5km NE: 3.0km	4.5km²	1957	1957-1960	1976-78	stripping ratio : 10m³/t	250m	32.0	O/C 37.0 U/C 45.0	1965	O/C	(1965-1993) 41989.4
(14) Nalaykha Deposit	Middle-East	TOV	47° 40'N 107° 18'E	37km SE of Ulaanbaatar by train & vehicle	gentle hills grassland	NS: 3.5km EW: 10km	35km²	1912	1925-26 1930	1931 1954-78	whole area	350m	59.0	76.0	1922	U/G	(1922-1993) 25,476.9
(15) Baganuur Deposit	Middle-East	TOV	47° 45'N 108° 23'E	120km ESE of Ulaanbaatar by vehicle	plain grassland	NNE: 12km WNW: 3.5km	42km²	1925	1964	1974-75	whole area	200m 350m	515.8	- 713.1	1978	O/C	(1978-1993) 34,536.3
(16) Shivee Ovoo Deposit	Middle-East	DORNOGOVI	46° 10'N 108° 33'E	20km SE of Choyr	rolling plain grassland	NW: 25km NE: 17km	425km²	1957	1986-88	1986-88 (partially)	Sineus whole area	350m	564.1	2,700	1992	O/C	(1992-1993) 748.4
(17) Chandagantal Deposit	East	HENTIY	47° 25'N 110° 05'E	280km E of Ulaanbaatar 160km ESE of Baganuur 40km W of Ondorhuun (by vehicle)	plain grassland	NS: 1.5km EW: 2.0km	3km²	1941	1941	1962-63 (partially)	1.2 x 0.8km	100m	122.9	213.0	1966	O/C	(1966-1993) 1,649.7
(18) Talbulag Deposit	East	SUHBAATAR	46° 55'N 112° 58'E	35km NW of Suhbaatar	plain grassland	NW: 5-6km NE: 12km	70km²	1939	1967	1980 (partially)	block II whole area	100m 300m	48.6	51.9 421.3	1976	O/C	(1976-1993) 1,532.2
(19) Aduunchuluun Deposit	East	DORNOD	48° 05'N 114° 28'E	6.5km N of Choybalsan	plain-hills grassland	NW: 6km NE: 7km	40km²	1951-1953	1962	1988-89 (partially)	south block whole area	60m 60m	230.0	400	1955	O/C	(1955-1993) 8,423.6
(20) Narynsohait Deposit	Middle-South	OMNOGOVI	42° 50'N 101° 40'E	300km SW of Dalanzadgad 30km N of border with china	plain desert	NS: 1.0Km EW: 11Km	30km²	1971	1971	1991 (partially)	2 blocks	100m 200m	40_50	200-250	1994	O/C	on preparing
(21) Ulaan Ovoo Deposit	Middle-East	SELENGE	50° 20'N 105° 00'E	5km W of Tushig 85km W of Suhbaatar	mountain forest	NS: 2km EW: 3km	6km²	1974	1979	1979-93	NS : 0.45km EW : 1.5km	150-160m 150-160m	23.6	42.1	_	O/C	on preparing
(22) Khoot Deposit	Middle-East	DUNDGOVI	45° 39'-45° 46'N 107° 39'-107° 46'E	90km SW of Choyr 120km ESE of Mandalgovi	plain grassland	NS: 5km EW: 5km	25km²	1964	1964	1964, 1992-94 (partially)	1 x 3km 3 x5km	100m 100m	82.3	190.9	1993	O/C	(1993) 3.8
(23) Tsaidamnuur Deposit	Middle-East	TOV	47° 22'N 108° 00'E	100km SE of Ulaanbaatar 10-20km S of railway	plain grassland	NE: 46km NW: 10-15km	500km²	1940s	1980s	no	whole area	300m	_	1700	_		
(24) Ovdok Huduk Deposit	Middle-East	DUNDGOVI	45° 32'N 108° 00'E	140km ESE of Mandalgovi 90km W of railway	plain grassland	NE: 16km NW: 3km	48km²	1964	1964, 1965	1968-72 (partially)	Middle b. WS b.	100m 100m	159.5	168.2	_		
(25) Sainshand Deposit	Middle-East	DORNOGOVI	44° 50'N 110° 08'E	18km SW of Sainshand	plain desert		10km²	1930s	1939-40		2.3km² 7.7km²	120m 300m	0.6	1053	1937		1937- (?) mined up to 35m from surface
(26) Hulstnuur Deposit	East	HENTIY	48° 20'N 112° 33'E	65km NE of Bayan-Ovoo (by vehicle)	rolling plain grassland, lake	NS: 5km EW: 10km	50km²	1944	1980-81	1980-81 (partially)	1.2 x 1.2km (1.44km²)	50m	11.2	190	_		
(27) Tugrugnuur	Middle-East	TOV	46° 55'N 104° 07'E	110km S of Malsykh	plain grassland	10 x 10km	80km²	1952	1984		whole area	300m	_	695	_		

Table 12 Mining Operation Factors of Each Coal Mine (1/2)

No	Coal Mine	Aimag	Location (Distance from major city)	Start Year (Operating Years)	Coal Quality Standard (as of 1995)						Mining Condition																	
					Moisture (Wr, %) (as received) *1)	Ash (Ar, %) (as received) *1)	Volatile matter (Vdaf, %) (dry ash free)	Total Sulphur (Sdf, %) *1)	Net Calorific Value (as received) *2)		Overburden Soil				Overburden Rock				Coal					Bench Angle	Overall Slope Angle	Stripping ratio	Mine Site	
									MJ/kg	kcal/kg	Name	Density (g/cm³)	Swell Factor	Bucket Fill Factor	Name	Density (g/cm³)	Swell Factor	Bucket Fill Factor	Dencity (g/cm³)	Swell Factor	Bucket Fill Factor				Width (m)	Length (m)
1	BAGANUUR	TOV	120km from Ulaanbatar	(17) 1978	33.0	18.0	45.0	0.5	13.6	3,250	quaternary sandstone	1.2	1.35	0.95	Middle and big grain siltsone	2.3	1.25	1.05	1.2	1.25	1.05	70 ∫ 80	37	design 2.7 chosen 3.4	6,000	14,000
2	SHARYN GOL	SELENGE	62km from Darkhan	(30) 1965	18.0	22.0	45.0	0.6	17.2	4,100	quaternary sandstone	1.2	1.35	0.95	Sandstone, Siltsone and hard claystone	2.3.	1.35 ∫ 1.25	0.95 ∫ 1.05	1.32	1.25	1.05	70 ∫ 80	35	~8.4	700	2,000
3	SHIVEE OVOO *3)	DORNOGOVI	260km from Ulaanbaatar	(3) 1992	40.0	15.0	45.0	1.5 *4)	11.3	2,700	quaternary sandstone	1.2	1.35	0.95	sandstone, siltstone	1.9	1.35 ∫ 1.25	0.95 ∫ 1.05	1.21	1.25	1.05	70 ∫ 80	37	(<35m) 1.89 (>35m) 3.15	5,000	7,000
4	ADUUNCHULUUN	DORNOD	7km from Choibalsan	(26) 1969	46.6	9.0	45.0	0.8	9.8~10.3	2,340 ~ 2,460	quaternary sandstone	1.2	1.35	0.95	sandstone	2.2	1.35	0.95	1.25	1.25	1.05	70 ∫ 80	37	1.2	750	2,010
5	CHANDGANTAL	HENTIY	55km from Undurkhaan	(28) 1967	30.0	13.0	46.0	0.6	12.2~21.8	2,925 ~ 3,075	quaternary sandstone	1.2	1.35	0.95	sandstone, claystone siltstone	2.2	1.35 ∫ 1.25	0.95 ∫ 1.05	1.3	1.25	1.05	70 ∫ 80	37	(48m) 1.2 (56m) 2.72	780	1,110
6	TALBULAG	SUHBAATAR	40km from Baruun Urt	(19) 1976	30.0	20.0	47.0	0.8	9.8~10.3	2,340 ~ 2,460	quaternary sandstone	1.2	1.35	0.95	sandstone, conglomerate, siltstone	—	1.35 ∫ 1.25	0.95 ∫ 1.05	1.3	1.25	1.05	70 ∫ 80	36	3.0	1,000	7,000
7	TEVSHIIN GOVI	DUNDGOVI	30km from Mandalgovi	(11) 1984	33.0	22.0	45.0	0.95	12.6	3,010	——	—	—	—	——	—	—	—	1.3	1.25	1.05	70 ∫ 80	36	0.5	——	——
8	TAVANTOLGOI	OMNOGOVI	100km from Dalanzadgad	(29) 1966	8.5	20.0	32.5	0.5	21.4	5,110	quaternary sandstone and sand	1.2	1.35	0.95	little grain Sandstone Siltstone, conglomerate	2.4 ∫ 2.5	1.35 ∫ 1.25	0.95 ∫ 1.05	1.3	1.25	1.05	70 ∫ 80	37	1.1	7,000	15,000
9	NUURSTKHOTGOR	OVS	133km from Bayanulgii	(32) 1963	5.0	30.0	27.0	0.4	17.1	4,085	quaternary sandstone	1.2	1.35	0.95	sandstone, hard shale	2.6	1.35	0.95	1.4	1.35	0.95	70 ∫ 80	37	(90m) 1.1 (190m) 3.2	365	1,882
10	KHARTARVAGATAI	UVS	94km from Ulaangom	(31) 1964	16.0	24.0	35.0	0.4	16.3	3,895	quaternary sandstone	1.2	1.35	0.95	hard sandstone	1.4 ∫ 2.6	1.35	0.95	1.4	1.35	0.95	70 ∫ 80	39	(100m) 0.14	500	1,000
11	KHUSHEET	HOVD	197km from khovd	(24) 1971	7.0	19.0	20.0	0.5	20.4~21.4	4,875 ~ 5,110	——	—	—	—	sandstone	2.6 ∫ 2.7	1.35	0.95	1.36	1.35	0.95	70 ∫ 80	38 ∫ 45	(100m) 1.3	570	1,600
12	ZEEGT	GOVIALTAY	98km from Altai	(30) 1965	15.0	18.0	35.0	0.5	16.7	3,990	quaternary sandstone	1.2	1.35	0.95	claystone, siltstone sandstone	2.4	1.25 ∫ 1.35	1.05 ∫ 0.95	1.4	1.35	0.95	70 ∫ 80	37	(40m) 1.56 (>40m) 3.83	500	4,200
13	MOGOINGOL	HOVSGOL	228km from Murun	(25) 1970	14.0	17.0	26.0	0.8	22.1	5,300	quaternary sandstone and sand	1.2	1.35	0.95	siltstone, hard sandstone freezed granite	2.35	1.25 ∫ 1.6	1.05 ∫ 0.90	1.3	1.25	1.05	70 ∫ 80	37	6 ~ 8	400	1,150
14	BAYANTEEG	OVORHANGAY	123km from Arvaikheer	(33) 1962	11.0	22.0	46.0	0.8	19.6	4,680	quaternary sandstone	1.2	1.35	0.95	basalt, oilsahle	2.3	1.35 ∫ 1.6	0.95 ∫ 0.90	1.3	1.25	1.05	70 ∫ 80	39	(<100m) 1.69 (100m) 2.56 (300m) 4.00	1,750	7,000
15	JINST	Bayankhongor	263km from Bayankhongor	(1) 1993	—	—	—	—	—	—	quaternary sandstone	2.4	—	—	weathered gravel, siltstone, claystone	2.5	1.22	1.05	1.34	1.35	0.95	—	—	0.93	——	——

Note: 1) less than 3) Coal quality standard is valid in 1995 only
2) more than 4) expected value is 0.5~0.9

(Source; Mining Institute)

Table 12 Mining Operation Factors of Each Coal Mine (2/2)

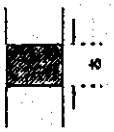
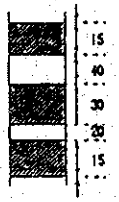
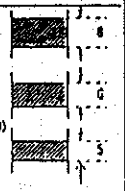
No	Coal Mine	Geological Condition									Mining Machines																Operating hours				Dewater and Drainage System	Production (×1,000)			
											Stripping										Common Machine		Coal Mining				Stripping		Coal Mining						
											Main Excavator (Electric Shovel)						Truck							Excavator (E/S)											
		Total thickness of seams (m)	Quantity of coal seam (Quantity of mining coal seam)	Thickness of mining coal seam (m)	Average Thikness of mining coal seam (m)	Thickness of interseam rock (m)	Average thickness of interseam rock (m)	Thickness of overburden (m)	Depth (m)	Dip (°)	8 m³	5 m³	4.6 m³	3 m³	2.5 m³	1 m³	40 t	32 t	27 t	12 t	3 t	Bulldozer	Drill	5 m³	1 m³	8 m³	Annual days	Shifts per day	Annual days	Shifts per day		Design	Plan ('93)	Actual ('93)	Cumurative Coal Production ('22～'93) (t)
																																Stripping (m³)			
																																Coal Mining (t)			
1	BAGANUUR	77	3 / (3)	6.95 ～ 80	35	5.9 ～ 120	70	0 ～ 250	150	8 ～ 20																						Well and pump System	—	—	—	34,536
2	SHARYN GOL	32.0	2 (1)	3.7 ～ 49.6	27.8	1.9 ～ 29	8	100	0 ～ 300	8 ～ 12	(4) (3)	(1)	(2) (1)				(43)					8	9	2 (3)		1	305	3	305	3	Tunnel, Shaft and pump system	4,000	3,500 1,300	2,307 1,205	41,989
3	SHIVEE OVOO	40.7	8 (2)	6 ～ 15.5	14	0.6 ～ 10.9	510	0 ～ 60	0 ～ 60	6 ～ 8																						Well and pump system	—	—	—	748
4	ADUUNCHULUUN	75.0	1 (1)	0 ～ 75.0	17.7	—	—	10 ～ 30	20	10 ～ 20		3					7		10			5	3	1			305	2	305	2	Bench floor back and pump system	800	765 405	558 351	8,424
5	CHANDGANTAL	50.0	1 (1)	50.00	40.2	—	—	1 ～ 30	34	4 ～ 6						2			4		2	1		2		226	1	226	1	Bench floor back and pump system	103 100	150 110	51	1,650
6	TALBULAG	39.0	2 (1)	4 ～ 49.5	30.5	5 ～ 37	19	0 ～ 200	0 ～ 200	5 ～ 8					1	2		3	3		2	2		1						Bench floor back and pump system	—	—	—	1,532
7	TEVSHIIN GOVI	150	5 (1)	55 ～ 64	44	3.5 ～ 66	40	0 ～ 150	0 ～ 250	3 ～ 8						1			5		1	1		1		305	1	305	1	Bench floor back and pump system	50	30('94) 25	23	1,227
8	TAVANTOLGOI	153	14 (1)	0.8 ～ 600	10	15 ～ 110	100	0 ～ 500	500	10 ～ 40						2			3		2	1		1		305	1	305	1	Bench floor back and pump system	150	75 50	43	2,086
9	NUURSTKHOTGOR	30.1	8 (1)	17.65 ～ 25.15	21.4	0.15 ～ 50	10	0 ～ 50	0 ～ 70	14 ～ 18						5			10		2	4		1		305	1	305	1	No drainage	116 100	200 135	93 95	3,140
10	KHARTARVAGATAI	85	1 (1)	80～85	80	—	—	0 ～ 300	0 ～ 300	30 ～ 60						1			2	1	2	2		1		305	1	305	1	No drainage	100	20 80	52	2,350
11	KHUSHEET	60.7	5 (1)	0.87 ～ 34.9	15.15	0.5 ～ 130	70	0 ～ 100	0 ～ 70	10 ～ 45						2			5		2	3		1		300	1	300	1	No drainage	50	50 45	35 31	1,191
12	ZEEGT	18.2	2 (1)	9.0 ～ 16.0	14.0	42 ～ 60	51	0 ～ 100	0 ～ 100	25 ～ 40						2			7		2	1		1		305	1	305	1	Bench floor back and pump system	50	35 25	25	1,261
13	MOGOINGOL	20.2	1 (1)	3.1 ～ 20.2	7.8	—	—	0 ～ 60	0 ～ 60	8 ～ 10		1				3	3		12		3	3		1		298	1	298	1	Bench floor back and pump system	100	420 60	112 27	1,646
14	BAYANTEEG	36	1 (1)	14～36	25	—	—	0 ～ 100	100	18 ～ 85				2		3		7	2		3	2		2		187	2	189	1	Bench floor back and pump system	200	300 160	164 108	4,047
15	JINST		7 (1)	42.65 ～ 49.7	45	0.24 ～ 2.87	1.5	0 ～ 200	0 ～ 200	35						1			3		1	1		1						——	—	—	—	33

(Source: Mining Institute)

Table 13 Long List

Coal Deposit	Megablock	Coal Class	Use	Calorific Value (kcal/kg) (are)	Calorific Value (kcal/kg) (daf)	Sulfur (%)	Reserves Mineable	Reserves Geological	Mining Method
1 (1) Nuursikhotogor	West	Bituminous ~ Subbituminous	Steaming	5,400 ~ 6,100	7,560 ~ 8,430	0.3 ~ 0.5	142.3	166.6	O/C
2 (11) Tevshiingovi	Middle-South	Lignite	Steaming	3,370	6,450	0.7	587.7	960.0	O/C
3 (12) Tavantolgoi	Middle-South	Bituminous ~ Subbituminous	Steaming Coking	6,500	7,700 ~ 8,400	0.8	3,500	6,500	O/C
4 (17) Chandgantai	East	Lignite	Steaming	3,000 ~ 3,400	6,580	0.9	122.9	213.0	O/C
5 (16) Shivee Ovoo	East	Lignite	Steaming	2,690 ~ 3,610	6,660	0.5 ~ 0.9	564.1	2,700	O/C
6 (18) Talbulag	East	Lignite	Steaming	2,850	6,000	0.8	48.6	421.3	O/C
7 (19) Aduunchuluun	East	Lignite	Steaming	2,400	6,480	1.1	230.0	400	O/C
8 (20) Narynsohait	Middle-South	Anthracite ~ Subbituminous	Steaming Coking	(6,500)	(7,700 ~ 8,400)	(0.8)	40 ~ 50	200 ~ 250	O/C
9 (22) Khoot	Middle-East	Bituminous ~ Lignite	Steaming	4,800	7,030	0.7	82.3	190.9	O/C
10 (23) Tsaidamnuur	Middle-East	Lignite	Steaming	3,600 ~ 3,800	6,800 ~ 7,100	0.4 ~ 0.7	-	1,700	O/C
11 (24) Ovdok Huduk	Middle-East	Lignite	Steaming (Liquefying)	3,070	6,300	2.8	159.5	168.2	O/C
12 (25) Sainshand	Middle-East	Bituminous ~ Subbituminous	Steaming	5,050 ~ 6,730 (base unknown)		n.a	0.6	1,053	O/C
13 (26) Hulstnuur	East	Lignite	Steaming	4,430 (ad base)	6,470	0.7	11.2	190	O/C
14 (27) Tugrugnuur	East	Lignite	Steaming	-	6,240	0.8	-	695	O/C
(Note) 1)Above coal quality isn't coal quality standard in Mongolia 2)Ulaan ovoo (Under construction)	Midle-East	Bituminous ~ Lignite	Steaming	4,270	7,370	0	24	42	O/C

Table 14 Short List of Coal Development Plans

No	Area Name		Coal seam condition			Reserves (10⁶t)			Coal mine development plan						
			Thickness (m)	Dip (°)	Strike length (km)	Depth (m)	Stripping ratio	Reserves	Annual Production (×10³t)	Average Overburden removal (×10³m³)	Volume of coal Production (×10³m³)	Average mining volume (×10³m³)	Fleet number	Capital (m$)	Operating cost ($/t)
1	Chandagantal			5	2	200	2.3	230	2,000	4,600	1,600	6,200	2.5	68	4.4
2	Tugrugnuur			7	15	88	4.2	288	2,000	8,400	1,600	10,000	4.0	95	7.1
3	Tsaidamnuur			5	4 5 6 } 5	200	2.3	864	2,000	4,600	1,600	6,200	2.5	68	4.4
4	Khoot	II	7	5	3	65	4.2	20	1,000	4,200	800	5,000	2.0	51	7.1
		III	6	5	3	55	4.2	15							
		V	7	2	3	58	4.2	50							
		Total						85							
5	Shivee Ovoo No. 2		 Total	6	4	71	4.2	20	1,000	4,200	800	5,000	2.0	51	7.1
				8	3	51	4.2	9							
				8	4	43	4.2	8							
								46							
6	Tavantolgoi		 Total	12	3	200	4.2	95	2,000	8,400	1,600	10,000	4.0	95	7.1
				3	4	132	4.2	265							
				12	4	105	4.2	35							
								395							

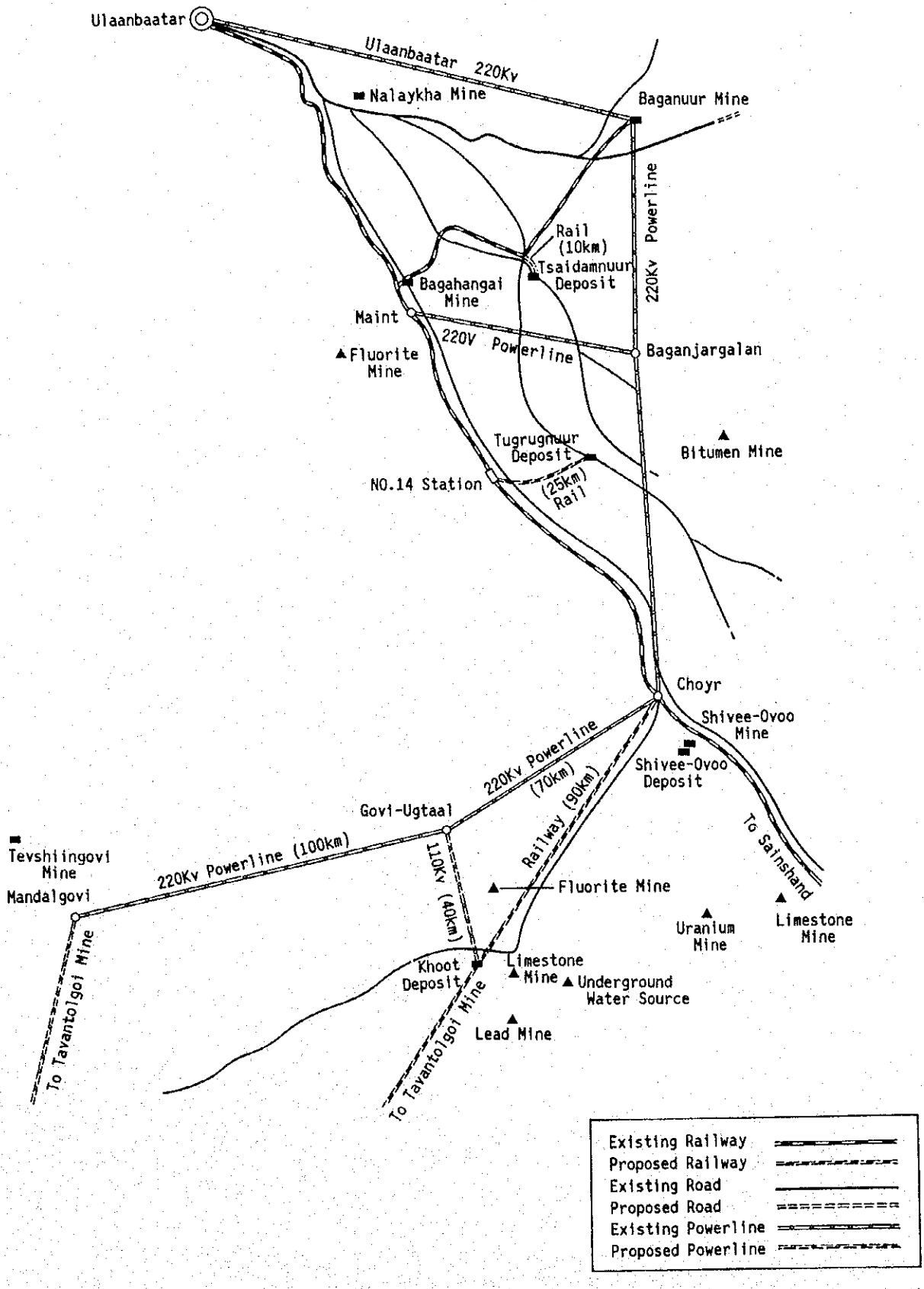


Figure 5 Location and Relevant Infrastructure of Selected Coal Mines