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FORESTRY PLANNING AND DEVELOPMENT PROJECT

CONSULTANCY REPORT

WOOD USE IN THE MINING INDUSTRY OF PAKISTAN

By

TurkPak International (Pvt) Limited

Under Contract to:
Winrock International
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Islamabad, Pakistan

for the
Government of Pakistan
and
United States Agency for International Development

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SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

- i) This study is conducted to provide baseline data to formulate a Forestry Planning and Development strategy in Pakistan. It envisages to ascertain the present wood consumption in mining, future trends, source of supply, preferred species and grades, prices, share of wood in the total cost, labour employed, taxes imposed, permits and licences required and problems of mining.
- ii) For this survey a list of mines in the country was prepared 15 mines out of this list were selected for survey. 29 coal firms and one salt agency working in these mines were surveyed. Winrock International, the sponsors of this study furnished a detailed questionnaire for survey.
- iii) The survey revealed that coal mines are the major consumers of wood in the shape of planks and props. Other mines i.e salt, phosphate utilized very insignificant quantity of wood. Coal miners pay royalty to the provincial governments on the basis of per tonne of coal extracted. This record of royalty is helpful to ascertain the total quantity of coal extracted. However a part of the coal produced is not recorded. According to TURKPAK survey 3.95 m tonnes coal was produced in Pakistan in 1987; 3.49 m tonnes in 1988 and 3.98 m tonnes in 1989.
- iv) It is estimated on the basis of survey that 30 m³ of wood is used for extraction of 1000 tonnes of coal. These estimates have been confirmed by Pakistan Mineral Development Corporation (PMDC). During 1987-88, PMDC

average wood consumption per 1000 tonnes of coal was 31 m³. Average consumption of wood for 5 years from 1983-84 to 1987-88 was 32 m³ per 1000 tonnes of coal. Almost all the past estimates of wood consumption by various experts are based on 56 m³ per 1000 tonnes of coal, which in our opinion are on higher side.

- v) The total wood consumption in coal mines in 1987 was 126,320 m³, in 1988 112,470 m³ and in 1989, 135,505 m³. It is estimated that the wood consumption in 1992 will be around 213,000 m³. It is assumed that the rate of wood use will decrease by 1 percent per annum due to reuse of wood and improvement in wood use technology. By the year 2010 A.D 307,000 m³ of wood will be required for 11.8 million tonnes of coal. Coal reserves in Pakistan are estimated at 1178 million tonnes out of which 102 million tonnes are proven and 1076 m tonnes are the indicated reserves. For all other minerals i.e salt, phosphate, soapstone and exploration of antimony, gold, silver and copper, a total of 985 m³ wood was used during 1989.
- vi) Size of prop used in mining varies from 0.6 metre to 3.6 metre in length and 18 cm to 37 cm in girth. Planks are of 1.2 metre x 10 cm x 2.5 cm size. In Sind props and planks are used in a ratio of 9:1. In other provinces this ratio is 4:1. Most popular mining timber is babul (Acacia nilotica) although jand (Prosopis cineraria) chir (Pinus roxburghi) and kail (Pinus wallichiana) are also used. While cutting props and planks to proper sizes 8 percent of the wood is sawn off. These pieces are given to the labour for using as fuel or used in pack walls.

- vii) All the wood is delivered to the mines by trucks. Government forests meet an insignificant demand of wood for mining. About 96.5 percent of the wood requirement in 80-81 and 84% in 1988-88 has been supplied by the private sector in Sind and Punjab. Babul is raised by private farmers in Sind under "hurrie" system and worked on 5-6 years rotation.
- viii) Mining wood prices vary from Rs.500/- per m³ in Punjab to Rs.1,600/- per m³ in Baluchistan. Wood constitutes 10 percent of total operating cost in NWFP, 25 percent in Baluchistan, 13 percent in Sind and 15% in the Punjab. So far no substitutes of wood have been successfully used in mining in Pakistan.
- ix) It is estimated that around 40,000 workers are employed in mining in the country. Out of these, around 5,000 workers are involved in timbering work and are employed on piece rate contract. Swat (NWFP) is an important source of mining labour.
- x) Advance income tax and sales tax on purchase of wood from government agencies, district councils export tax, octroi tax, union council tax; and transport fees in NWFP are the various charges on wood: Permission for cutting of trees is required in some parts of the country and a transit pass for transport of wood is required in Sind, NWFP and upland districts of the Punjab. Poor law and order situation in the country, red tapism in issue of permits, allegations of illegal demands by Government functionaries from wood dealers and unorganised nature of wood production/trade are the problems in this sector.

- xi) It is recommended that government should assist the farmers to raise babul plantations by providing incentives and facilities. These incentives may include increased supply of canal water for tree plantations, (when water is surplus), technical advice, good quality seed and saplings and an objective marketing system. Since demand of wood for mining is increasing and supply is limited. Therefore, unless the requisite incentives and facilities are provided, wood production may remain static and is likely to cause shortages in future.
- xii) Permits and taxes be streamlined in such a way that Government revenues are not affected but at the same time the wood traders/dealers should not suffer.

1. Background

Under the Forestry Planning & Development Project of the Government of Pakistan and USAID, the study is designed to collect data on the present wood consumption trends and future demands of woody rawmaterials in Pakistan. The survey was undertaken specifically to gain an understanding of wood consumption in different consuming sectors. On the basis of this survey future demands by the industry will be ascertained and a private farm forestry, action plan to grow the required species will be dully prepared by Government of Pakistan. TURKPAK International (Pvt) Ltd; a professional firm of consultants was selected to collect nationwide information relating mining, wood yards and Brick Kiln Industry. The present report is the final version of the mining sector report. Reports relating other two sectors have been submitted seperately.

2. Parameters of the Study

Terms of reference provided by Inspector General of Forests, Islamabad (Project Manager) and Winrock International (Technical Assistance Team) defines the parameters for the assignment as following:

- To collect and review existing documents, reports and statistics and prepare a written summary and evaluation of the use of wood in Mining.
- To conduct sample survey of firms in mining by actual visit to premises using the questionnaire specifically designed by Winrock International.
- To present a comprehensive report on the findings. Findings which identify market linkages, bottlenecks

and/or market constraints to be highlighted and to present a seminar on the findings of the consultancy to Government of Pakistan and USAID project personnel.

- The assignment to be completed within 12 weeks.

3. Methodology and Approach

Primary data were collected from the following fifteen mines located in Punjab, Sind, NWFP and Baluchistan provinces of the country.

- | | |
|----------------------|---------------------|
| - Dandot | - Makarwal |
| - P. D. Khan | - Cherat |
| - Khewra (Coal) | - Sor Range |
| - Katha | - Khost Shariq |
| - Kala Bagh | - Pir Ismail Ziarat |
| - Knewra (Rock Salt) | - Degari |
| - Lakhra | - Meting Jhimpir |
| - Sonda Thatha | |

A total of 30 firms (29 coal and 1 rock salt mining) were surveyed which are operating in these mines. The firms includes Public and Private Sector Agencies and PMDC colleries.

Secondary data/information was obtained by visits/discussion with the government officers, PMDC officers, Pakistan Forest Institute Peshawar, State, Provincial and Local Government Offices, Trade Association, Chambers of Commerce & Industry and many knowledgable people in Trade and Industry. During field surveys it was revealed that Cherat mines in NWFP were inoperative for sometime past and were out of bonds. Similarly mining operations had not been initiated in Sonda (Sind). PMDC projects for Sonda were being processed. As such no statistical data for Sonda were available and has not been

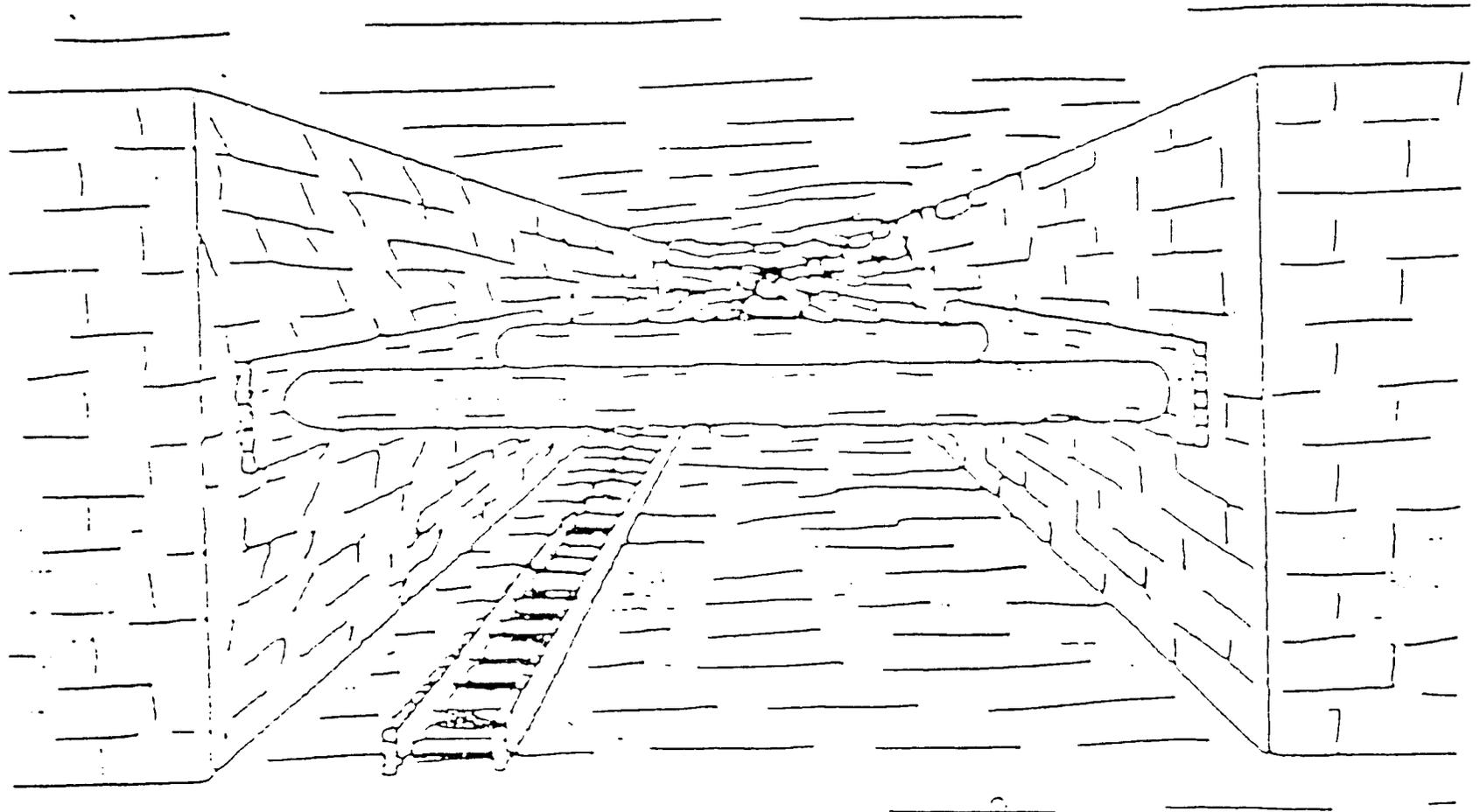
included in this survey. The information available was tabulated and the results interpreted. For this purpose the total production of minerals using wood has been computed. Average consumption of wood per tonne of mineral production was calculated from the data obtained through these questionnaires. The information provided by the mining firms regarding prices, labour, planned future production was used to workout the future demand of wood.

Out of twentynine coal firms and one salt firm surveyed five firms are in public sector (PMDC) rest of the 24 firms are in private sector. PMDC operates. Jattaand Bahadar Khel (rock salt mines) in NWFP, Makarwal (coal mine) and Khewra (rock salt mine) in the Punjab, Lakhra and Jhimper (coal mines) in Sind, Sorange, Degari and Shahrag (coal mines) in Baluchistan.

4. Wood Use in Mining - The Need

The underground mining methods are based on the principle that the overlying strata must be supported by some artificial or natural means. The provisions made for this purpose include permanent support of the rock mineral or seam left in place as pillars and temporary support of timber. Certain rocks such as salt do not require temporary support being self supporting. In other rocks the temporary support is not intended to take the entire weight or stress of the roof or superincumbent strata but to prevent a bad roof from becoming worse.

4.1 The artificial supports are created at the face, in roadways to maintain the immediate roof unbroken, to contain the bulging walls and prevent fall of stones from the rock. Clearly it is impossible for the wooden support to resist



SUPPORT OF BULGING PACKWALLS WITH THE HELP OF WOODEN PROPS,
HEAD FOOT BOARDS. ALSO IN THE PICTURE ARE WOODEN SLEEPERS
UNDER RAIL TRACK.

any movement of strata under which it is set. In case of coal, the rock pressure is estimated at 2.3 tonnes per square metre area for every one metre depth. At a depth of 500 metres the rock pressure would be 1150 tonnes per square metre. If one wooden prop is assumed to support an area of one square metre, at a depth of 500 metres the weight of the strata above it would amount to 1150 tonnes (Gill 1984). Manifestly no prop can possibly support such an enormous weight or even delay materially the settling down the strata.

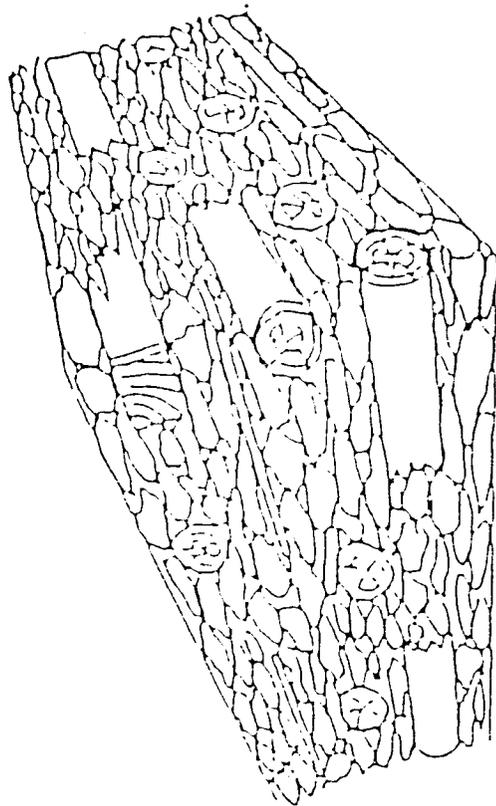
4.2 To carry the whole weight of strata, reliance is placed on solid rock pillars, packs, or pack walls. Timbering has the limited object of maintaining roof sides unbroken or prevent detached pieces of rock from falling causing injuries to human-beings or damage to machinery or equipment. Furthermore, the props are complementary to other elements in the system of supports i.e kogs, chocks and planks.

Kogs and chocks are forms of wooden supports given to the roofs in the mines: wooden props are placed one above the other in a square form. The hollow pillar so constructed is called chock.

In addition to roof support, wooden props and planks are used in mining for face support, roadway support, wall support against bulging and inward movement, support at main submain enteries, pack walls and sleepers for railtrack. Wood is also used by the workers for cooking and heating.

5. Past Studies

5.1 Estimates of wood consumed in mining industry have been made in a number of studies in the past. Ishaque (1957) in his study on "Timber Trends in Pakistan" estimated that 27,500 m³ timber was annually consumed for mining in Pakistan.



END OF PROPS, BITS OF TIMBER, BROKEN PLANKS AND
WOOD JUNK USED SKILLFULLY IN CONJUNCTION WITH
STONES TO BUILD PACK WALLS.

He indicated that production of coal in Pakistan increased from 437,000 tonnes in 1950 to 543,000 tonnes in 1955 and calculated that 56 m³ wood was used in the production of 1000 tonnes of coal. In his paper entitled, "The use of Timber in Coal Mines" Ishaque (1960) indicated that 25,000 m³ wood was consumed in mining timber in 1950 and 31,000 m³ in 1955. He worked out that the ratio of sawn planks to round wood (props) was 2:3. Basing his estimates on the available data, he projected an annual increase of 5% in coal production and proportionate increase in wood consumption.

5.2 Lerche and Khan (1967) estimated coal production in Pakistan in 1965 as 1.5 million tonnes and wood consumption in mining as 67,960 m³. They verified the estimates of Ishaque that props and planks were used in a ratio of 2:3. They projected that by 1985 coal production in Pakistan would be 12.0 million tonnes and wood consumption 169,900 m³. In their opinion unit consumption of wood for mining was expected to decrease from .042 m³ per tonne in 1965 to .023 m³ per tonne of coal in 1985 because of reuse of wood and improvement in technology.

5.3 Rasul (1968) estimated that 33,980 m³ props and 5,690 m³ planks were consumed in Baluchistan in 1967 to produce 700,000 tonnes of coal. His source of information were the forest contractors who supplied mining timber to Baluchistan. In the working paper prepared for a meeting held on 28.1.1969 at Lahore on Forestry Development in West Pakistan, Rana and Qadri (1968) estimated that in 1965, 42,475 m³ timber was used in mining in Pakistan. Their projection for 1985 was 106,180 m³. They further estimated that demand for mining timber would increase by 4.6% per annum. All this data does not support the report of Lerche and Khan who had predicted a decrease in the consumption of wood per unit of coal

production. Draper and Ewing (1978) the authors of World Bank Staff working paper No.284 on "Forestry Sector Survey of Pakistan" estimated that 67960 m³ timber was consumed in Pakistan in 1965 and 118,900 m³ in 1972-73. Their 1965 estimates of consumption of wood are almost the same as that of Lerche and Khan. Khattak and Amjad (1981) using Ishaq's estimate of 56 m³ for 1,000 tonnes calculated that about 67,200 m³ wood was consumed annually in mining industry in Pakistan.

5.4 In a working paper (Anon 1989) on demand of mining timber prepared for consideration of the Punjab Government it was estimated that 26,600 m³ timber was required for the coal mines in Salt range. Coal production in Punjab was estimated at 20% of Sindh and Baluchistan combined i.e 0.54 million tonnes. The demand for mining timber was expected to rise @ 10% per annum. The working paper emphasised that government should implement a program to raise mining timber on the area in possession of the forest department and also on private lands.

5.5 Sirhandi (1990) in his paper, contributed to wood producers and wood users seminar Lahore (1990), estimated that 1,818,000 metric tonnes of coal was produced in Sindh and Baluchistan which consumed 94,000 m³ of wood although the demand was 140,000 m³. State forests supplied 3.5% of the total demand; the rest of the demand was met with by private sector. Almost all the demand was for babul (Acacia nilotica). The author estimated that by 1995, demand for mining timber would be 225,000 m³ and supply will not be able to keep pace with the demand. In his paper, Sirhandi has given estimates of babul production in the private sector, marketing, inflow, prices and grading. Sirhandi found that prices of mining timber were stable but there was a need to increase production in the private and public sector.

Rafique and Parvaiz (1990) in their paper, entitled "Wood Requirements of the Mining Industry" contributed in the same seminar, based their calculations on 56 m³ timber for 1,000 tonnes of coal. They estimated that 1.6 million m³ wood was consumed for 2.8 million tonnes of coal in 1989-90 in Pakistan. They apprehended that supply of mining timber would not be able to keep pace with the demand, hence, there was a need to increase production of mining timber in public and private sector under an objective development program.

5.6 It may be seen that the above estimates vary regarding consumption of wood for a unit of coal produced. This may be due to great variation in use of wood for different mines, inadequate samples, reluctance of owners to furnish accurate information for fear of taxation or non maintenance of record of timber by mine owners. These studies have identified the problem of scarcity of mining timber but the constraints of permits, licences and taxes have not been elaborated in these publications.

8. Coal Reserves and History of Mining

6.1 Estimated Coal Deposits in Pakistan

In Baluchistan the coal fields comprise of Sur Range-Deghari, Sharig-Harnai, Pir Ismail Ziarat, Duki Chamalang, Mach-Bibi NaNi and Johan area. In Punjab, the coal fields are located in eastern-western and central salt range, between Khushab-Dandot and Khewra, and Makarwal in district Mianwali. In Sind the coalfields are located in Lakhra, Thatta Sonda, and Meting Jhampir. (Ahmed 1936) has estimated the total coal reserves at 562 million tonnes distributed as under:

Lakhra coalfield (Sind)

Extent	200 sq.kms.		
Reserves	Proved	Probable	Possible
(in million tonnes)	60	40	200
	Total = 300		

Sonda-Thatta coalfield (Sind)

Extent 600 sq.kms.

Reserves	Proved	Probable	Possible	
(in million tonnes)	15	47	78	
				Total = 140

Duki coalfield (Baluchistan)

Extent 300 sq.kms.

Reserves	Proved	Probable	Possible	
(in millions tonnes)	3	5	5	
				Total = 13

Sor Range-Deghari coalfield (Baluchistan)

Extent 50 sq.kms.

Reserves	Proved	Probable	Possible	
(in million tonnes)	6	12	16	
				Total = 34

Salt Range coalfield (Punjab)

Extent 260 sq.kms.

Reserves	Proved	Probable	Possible	
(in million tonnes)	7	10	50	
				Total = 75

alikh (1986) quoting the IEDCS estimates of 1982 has indicated that Pakistan has 1196 million tonnes of coal as under:

(TABLE 1)
COAL RESERVE ESTIMATES (TONNES)
INDICATED/INFERRED (1982) million tonnes

	<u>Proved</u>	<u>Indicated/ Inferred</u>	<u>Total</u>
<u>PUNJAB</u>			
Makerwal/Gullakhel	1.0	15	16
Salt Range	5.0	80	86
<u>BALUCHISTAN</u>			
Sor-Range/Denari- Sinjidi	12.0	33	45
Khoat-Sarigh-Harnai	10.0	50	60
Mach	6.0	15	21
Duki	-	40	40
Abe-Gum	-	102	102
Sor-Range-Kutch	-	30	30
<u>SINDH</u>			
Lakhra	63.0	182	245
Metind-Jhampir	5.0	35	40
Sonda-Thatta	-	511	511
TOTAL	107.0	1023	1196

However, Akhtar (1990) has given an estimate of 4.78 billion tonnes of coal in Lakhra & Sonda area. It is advisable to accept the IEDCS estimates to be more realistic.

6.2 History of Mining

The North Western Railway opened several collieries in the Salt Range, Sor Range and Khost-Sarigh areas between 1890 and 1900 to provide fuel to its locomotives. These well planned organized collieries produced 100000 tonnes of coal per annum. In 1900 good quality coal in Bengal and Bihar was discovered and production in Punjab and Sindh dropped from 115283 tonnes in 1906 to 54120 tonnes in 1929. During world war II (1939-45) the production increased to 3 million tonnes half of which was produced in Baluchistan. After independence

the production dropped to 250,000 tonnes but rose to 744400 tonnes in 1959. The leases increased from a few dozens in 1947 to several hundred in about a decade. In 1960 Government of Pakistan called private and public sector coal miners and gave incentives of tax concessions, and import licenses to import trucks.

The production increased to 0.9 million tonnes 60-61 against a target of 1.25 million tonnes in 63-64. It is important to understand that increase in coal production depends entirely on the extent of available market. The market is in turn dependent on the scope for coal utilization. Advanced technology, incentives and discovery of new mines are helpful in increased production only when demand for coal increases. Annual coal production has fluctuated as under:- (Malik 1986)

(TABLE 2)
NATIONAL COAL PRODUCTION

Year	Production in tonnes
1900	100,000
1929	54,120
1943	300,000
1947	363,488
1948	244,643
1949	337,643
1950	443,763
1951	512,807
1952	609,661
1953	593,100
1954	562,634
1955	537,441
1956	655,104
1957	523,125
1958	606,077
1959	744,398

continued...

Continued table 2

1959-60	830,319
1960-61	915,324
1961-62	955,022
1962-63	1,242,391
1963-64	1,256,898
1964-65	1,231,506
1965-66	1,291,170
1966-67	1,280,000
1967-68	1,239,000
1968-69	1,428,000
1969-70	1,269,000
1970-71	1,324,000
1971-72	1,255,000
1972-73	1,204,000
1973-74	1,129,000
1974-75	1,314,000
1975-76	1,138,000
1976-77	1,147,000
1977-78	1,279,000
1978-79	1,387,000
1979-80	1,569,000
1980-81	1,577,000
1981-82	1,750,000
1982-83	1,609,000
1983-84	1,870,000
1984-85	1,848,429
1985-86	1,995,464
1986-87	2,022,962
1987-88	2,642,336
1988-89	2,335,956
1989-90	2,712,445

Public Sector Coal Production

Year	Production in Tonnes
1960-61	213,695
1961-62	232,591

continued...

Continued table 2

1962-63	256,670
1963-64	262,899
1964-65	295,866
1965-66	296,349
1966-67	332,426
1967-68	453,983
1968-69	434,215
1969-70	472,193
1970-71	386,997
1971-72	377,008
1972-73	343,467
1973-74	321,232
1974-75	298,317
1975-76	255,002
1976-77	258,900
1977-78	235,174
1978-79	237,042
1979-80	253,660
1980-81	206,940
1981-82	204,147
1982-83	171,632
1983-84	220,436
1984-85	257,041
1988-89	202,000

6.3 New Mines

Exploration of new mines is dependent on technical and economic/marketing factors. What must be known is that the new mine contains sufficient coal reserves and their marketing will be a viable economic proposition. Lakhra and Sonda Thatta coal fields in Sind have the potential for new coal mines. Their extent of area and estimated reserves have been indicated in the para 6.1 . Their exploration and mining

program will depend upon effective demand. At present 79 percent of coal production is used in brick-kiln industry which may expand 3 percent per annum. If the new mines are to be explored, new power plants fueled by coal will have to be planned in Sind, Punjab and Baluchistan. In view of the present oil crisis, these coal fired plants may be quite feasible.

7. Production of Minerals and Wood Use

7.1 Coal Production

Coal mines are the major consumers of wood in the form of planks and props. Production of coal is duly accounted for because the producers have to pay a royalty of Rs.15/- per tonne in Sind, Rs.12/- per tonne in Balochistan, Rs.18/- per tonne in Punjab and N.W.F.P. However some quantity of coal produced is not recorded due to a variety of reasons. This unrecorded production in certain areas is as high as 60% to 100% of the recorded production. Mirza (1986) is also of the view that the total reported production of the country is about 2 million tonnes while it is believed that a few 100,000 tonnes production goes unreported. For calculation of wood used/required this unrecorded production has to be taken into consideration. The coal production in Pakistan is given in Table (3) as per estimates of Planning Commission, 1987.

TABLE 3

PRODUCTION OF COAL (MILLION TONS)

Province/Years	1987	1988	1989	1990	1991	1992
Baluchistan	1.705	1.897	2.115	2.353	2.624	2.871
Punjab	0.8767	0.973	1.085	1.210	1.348	1.476
NWFP	0.1376	0.153	0.167	0.1899	0.211	0.232
Sind	1.38	1.535	1.708	1.904	2.122	2.324
Total	4.099	4.558	5.075	5.657	6.305	6.903

SOURCE: Seventh Five Years Plan 1988-93, Planning Commission Government of Pakistan.

Table 4
Coal Production (Million tonnes) - Government Estimate

Province	1987	1988	1989
Baluchistan	1,327,044	1,219,294	1,475,348
Punjab	595,807	561,243	467,494
N.W.F.P.	35,708	35,204	43,652
Sind	683,777	520,215	725,428
Total	2,642,336	2,335,956	2,712,445

Source: Central Mining Inspector, Government of Pakistan, Islamabad.

Coal production as estimated by TURKPAK is as under. It takes into account the unrecorded production:-

Table 5
Coal Production (Million Tonnes)
TURKPAK ESTIMATES

Province	1987	1988	1989
Baluchistan	1,592,453	1,462,394	1,770,848
Punjab	1,191,614	1,122,486	934,997
N.W.F.P.	71,416	70,408	87,304
Sind	1,094,048	832,344	1,160,696
Total:	3,949,526	3,488,532	3,953,845

Source: TURKPAK survey 1990

7.2 Production Trend in Coal Mines

Coal is not being produced according to full capacity of mines. According to our survey the coal mines are working at 75% of their production targets in the Punjab, 86% in Sind, 92% in Baluchistan and 85% in NWFP. No mine in Sind was inclined to increase its coal production than the level of 1988, due to law and order situation. However miners in other 3 provinces intended to increase production provided there was effective demand for coal. The estimated coal production and capacity of coal mines in 1990 is stated in table 6 as under:-

Table 6
Capacity and Production of Coal

000 tonnes

Province	Coal Production in surveyed mines	Capacity of surveyed mines	Total Estimated production	Total estimated capacity
Baluchistan	163	199	1771	2160
Punjab	236	315	935	1246
N.W.F.P.	14	16	87	102
Sind	688	800	1160	1349
Total	1101	1303	3953	4857

Source: TURKPAK Survey 1990

7.3 Coal Consumption in Brick Kilns

Brick kilns are the major consumers of coal. Paracha (1986) indicated the use of indigenous coal in 1980-81 as under:

Brick Industry	- 82.3 percent
Power	- 1.3 Percent
House Hold	- 1.3 Percent
Others	- 12.8 Percent
Distribution Losses	- 2.3 Percent

According to TUHKPAK Survey, 1990, 3953645 tonnes of coal was produced in 1989 and 3099683 tonnes was consumed by the Brick Kilns. Thus 79 percent coal produced was used in Brick Kilns. Provincewise position is given in table no 7 as under:-

Table 7
Coal Consumption in Brick Kilns

000 Tonnes

Province	Production of Coal 1989	Consumption in Brick Kilns 1989
Baluchistan	1.771	0.14
Punjab	0.934	1.58
N.W.F.P.	0.087	0.74
Sind	1.161	0.64
Total	3.953	3.10

Source: TUHKPAK Survey 1990.

7.4 Wood Use Per Unit of Coal

Our study indicated that in 1989, 22 m³ wood was used in Sind, 30.9 m³ in Punjab and N.W.F.P. and 44.2 m³ in Baluchistan for production of 1000 tonnes of coal. The variation is due to the nature of rock, local customs and substitutes. The coal bearing areas in Baluchistan are much folded and faulted. The seams dip steeply and there is heaving of floor. Some old mines are 800 meters deep. Thus not only more timber support is required but also more frequent change of timber is required. Hence unit consumption of wood in Baluchistan is high. The provincewise quantity of planks and props per thousand tonnes of coal produced is shown in Table (8).

Table 8

WOOD CONSUMED PER THOUSAND TONNES OF COAL

Province/Year	PROPS/M ³			PLANKS/M ³			TOTAL/M ³			Avg. M ³
	1987	1988	1989	1987	1988	1989	1987	1988	1989	
Baluchistan	29.9	29.8	34.2	7.9	8.4	10.0	37.8	38.2	44.2	39.7
Punjab	25.6	24.4	24.0	5.1	6.0	6.9	30.7	30.4	30.9	30.6
NWFP	25.6	24.4	24.0	5.1	6.0	6.9	30.7	30.4	30.9	30.6
Sind	21.4	21.2	19.1	3.6	3.2	3.0	25.0	24.4	22.1	23.8

Source: TURKPAK Survey - 1990. Volume of Sawn Planks has been converted into roundwood.

7.5 Projected Wood Consumption In Mining

The total consumption of wood in coal mines in Pakistan is projected as under in Table (9). These projections are based on the unit consumption indicated in table 8 and total coal production estimated by the planning commission.

TABLE 9

PROJECTED CONSUMPTION OF WOOD IN COAL MINES
(BASED ON COAL PRODUCTION ESTIMATES OF THE
PLANNING COMMISSION)

Province/Year	1987	1988	1989	1990	1991	1992
Baluchistan	63,240	71,137	91,537	92,449	103,097	112,802
Punjab	26,564	29,033	32,897	36,506	40,670	44,531
NWFP	688	918	1,000	1,076	1,196	1,315
Sind	34,169	37,024	37,490	44,953	50,100	54,869
Total:	124,661	138,162	162,924	174,984	195,063	213,517

TURKPAK Estimates 1990, Based on Estimates of Coal Productic
By The Planning Commission

Provincewise consumption of wood based on the provincewise averages of table 8 above and the coal production estimated by TurkPak Survey 1990 is as under table (10).

TABLE 10

Wood consumption in coal mines
(BASED ON TURKPAK ESTIMATES OF COAL PRODUCTION)

Province	1987	1988	1989
Baluchistan	60195	55898	78271
Punjab	36582	34123	28885
N.W.F.P.	2192	2140	2698
Sind	27351	20309	25651
Total:	126320	112470	135505

Source: TURKPAK Survey 1990

7.6 The above estimates of wood consumption are based on the information supplied by private and public sector firms engaged in coal mining. Too much reliance cannot be placed on the data procured from private miners. Wood consumed by Pakistan Mineral Development Corporation, which is a government agency, would be of some interest. The wood consumed by PMDC works out to 31 m³ per 1000 tonnes during 1987-88 against the weighted average of 30.8 m³ per 1000 tonnes, in our survey. Average consumption of wood by PMDC, based on 5 years data is 32 m³ per 1000 tonnes of coal produced. Their figures regarding total volume of wood consumed, viz a viz coal production are based on reliable record and may be taken as fairly accurate. These are given in Table (11).

The sizes of wood consumed by PMDC in Makarwal Coal Mines vary from year to year. PMDC has two types of activities for

DEVELOPMENT CORPORATION FOR MAKARWAL
1987 - 88

87-88 Coal Production 65,160 Tonnes

<u>Type of wood/ Sizes (m x cm)</u>	<u>QUANTITY CONSUMED(m³) 1987-88</u>	<u>AVERAGE CONSUMPTION OF WOOD FOR 1000 TONNES COAL (m³) 1987-88</u>	<u>5 YEARS AVERAGE CONSUMPTION OF WOOD (m³) 1983-84 TO 1987-88</u>
<u>BABUL</u>			
1.5x25	572	8.8	7.10
1.8x30	370	6.0	7.80
2.1x30	495	7.4	7.40
2.4x32	174	2.6	2.70
2.7x22	117	1.8	1.70
3.0x37	37	0.53	0.60
1.5x23	328	0.50	0.40
SUB-TOTAL	2,093	27.63	28.55
<u>HARDWOOD OTHER THAN BABUL</u>			
1.5x25	0.40	0.01	0.40
1.8x30	0.25	0.01	-
2.1x30	6.00	0.09	0.20
2.4x33	7.00	0.10	0.20
3.0x37	11.70	0.18	1.10
2.7x3.96	24.4	0.38	0.20
1.5x23	-	-	-
SUB-TOTAL	49.75	0.77	2.10
1) <u>KAIL..</u>			
1.2x50	42.5	0.60	0.40
2.4x37	14.4	0.30	0.40
2.7x37	17.2	0.30	0.50
3.0x42	11.1	0.28	0.05
3.6x55	11.1	-	-
SUB-TOTAL	96.3	1.48	1.35
<u>KAIL PLANKS</u>			
1.2x10x2.5	62.3	0.90	

coal production namely normal and developmental (exploration and improvement). The variation in wood sizes is due to the nature and extent of development activities.

8. Future Trends

8.1 Coal Mining

Brick kilns, Cement factories, WAPDA (Water and Power Development Authority) and Pakistan Railways are important consumers of coal. It is estimated that demand for bricks will increase by 2.9% per annum. WAPDA will also need 0.7 million tonnes of coal in 1992 in addition to its present requirement (Afghan 1990). Demand of coal by Pakistan Railway is expected to decrease due to conversion of locomotives to diesel and electricity. It is estimated that coal production will increase @ 3% per annum and 11.8 million tonnes of coal will be produced by 2010 A.D. It is further estimated that wood requirement for coal will decrease from 30 m³ per 1000 tonnes in 1990 to 26 m³ per 1000 tonnes in 2110 due to reuse of wood and improvement in technology. Thus 307,000 m³ of wood will be required for production of 11.8 million tonnes of coal in 2010 A.D.

8.2 Rock Salt Mining

Mining of rock salt does not require artificial or temporary supports of wood. The permanent supports are pillar and walls, prepared from the rock itself. They are so effective that additional artificial support is not required. Pakistan Mineral Development Corporation (PMDC) salt mine at Khewra, however, consumes wood for its rail track meant for transport of salt from the mine to the carriage sites. Their past and future requirement of wood vis-a-viz production of salt is as under Table (12).

TABLE 12
 USE OF WOOD PINUS ROXBURGHII (CHIL) INC
 SALT MINING BY PMDC

	Y E A R					
	1987	1988	1989	1990	1991	1992
Salt Production (000 tonnes)	260	250	228	230	235	240
Wood Consumption (M ³)	35.4	25.5	20	70	73	77

Source: TURKPAK estimates 1990.

PMDC salt mine Khewra needs chil (Pinus roxburghii) sleepers and prefer to purchase the same from provincial forest departments. No wood is required by other salt mines including those 4 salt mines which are in private sector. In a competitive market, they save expenses on construction and maintenance of the rail track. Instead of rail track, they construct the motor-way in such a manner that the truck can be taken right upto the site from where the salt is loaded. Competent (self-supporting) nature of rock-salt facilitates construction of such drive ways resulting in substantial decrease of transport expenditure. As such the small quantity of wood used in PMDC salt mine Khewra will last till such time as the rail track remains in use. It may be seen that production of salt by PMDC is declining whereas population is decreasing. The traders have started purchasing salt from private mines. Unit cost of production of private mines is low and they offer salt at competitive rates.

8.3 Phosphate Mining

Phosphate is mined in Kakul (Abbotabad-NWFP) by the Sarhad Development Authority and private entrepreneurs in NWFP. A

Small quantity of babul wood, is used for phosphate mining which is shown as under in Table (13).

TABLE 13

Wood Use in Phosphate Mining

	1988-89	1989-90 ^c
Production of Phosphate (Tonnes)	35,000	30,000
Timber (Babul consumption) (m ³)	30	75
Price (Rs/m ³)	2,000	2,000
Total Cost (Rs.)	60,000	150,000

SOURCE: TURKPAK Survey - 1990

Sarhad Development Authority (NWFP) undertakes exploration of tungsten, antimony, gold, silver and copper in Chitral, Lead and Zinc in Besham, copper in Dir and consumes 110 m³ of babul worth Rs.250,000/= per annum.

8.4 Other Mines

Underground mines are also dug for other minerals such as Celceitite (used for paints) in Sind and Soapstone (talc) and Barite in NWFP. However little wood is consumed for Celceitite, because shallow tunnels 4-5 metre in length are dug, which can stand without support. These short tunnels' can meet the small demand for Celceitite. For Soapstone 800 m³ wood per annum is used.

9. Mining Timber

9.1 Sizes

various provinces are given in Table (14) as under:

TABLE 14
PREVALENT SIZES OF WOOD IN MINING

S.No.	Punjab & NWFP	Sind	Baluchistan
	M.Length cm (Dia)	M.Length cm (Dia)	M.Length cm (Dia)
1.	0.6 x 18	1.8 x 25	1.7 x 28
2.	1.2 x 30	2.1 x 28	2.1 x 28
3.	1.5 x 32	2.7 x 30	2.7 x 30
4.	1.8 x 36	3.0 x 34	3.0 x 34
5.	2.1 x 35	3.6 x 37	3.6 x 37

SOURCE: Turkpak Survey - 1990

The substantial variation in sizes of wood used in mining in different localities appears to be due to nature of rock, use of other elements, local customs, availability of wood and expert advice available to the mines on wood use.

In Baluchistan, and Sindh the drivages are 1.7 to 2.1 metres in height and 2.5 to 3.5 metres in width to permit ventilation and efficient haulage system. There is little breakage of timber supports because sandstones forms the roof of the drivages. Hence long sized props can be used. In the Punjab, the drivages are comparatively smaller and timber supports are more liable to breakage, hence comparatively small sized props are used.

Age of trees suitable for mining timber:

Sizes of props and planks required by the mining industry can be obtained from 5-6 year old babul trees. However this rotation age varies according to the site quality.

9.2 Transportation

Wood is transported by trucks from the wood markets to the mining sites. Since the mines are generally located away from the wood markets and railway stations, other means of transport i.e railway, camel, horse-bullock drawn carts are not convenient.

9.3 Wastage Factor

92% of the wood purchased is actually used in mining. 8% is sawn off while fitting into suitable sizes in the mines. The odds, ends and pieces which thus become available are given to labour for cooking and heating or used in pack walls. There is no wastage because the miner would be required to purchase fuelwood for the labour if sawn off end odds and pieces were not available.

9.4 Species of wood used in Mining

Babul is almost the only wood used for props and planks. A very small quantity of jand (Prosopis Cinenaria) for planks chir (Pinus roxburghi) and kail (Pinus Wallichiana) for props planks and rail-line sleepers is also used. Babul is the most popular wood and is reputed to be an excellent timber for props. Babul is moderately heavy with average weight of 0.83 gm/ccm. It has coarse texture, is quite durable and seasons very well. A small quantity of "Kharlanja" wood is brought to "Gula Khel" (PMDC Makarwal Mines) from Banu.

Chil is also durable when under cover, it is easy to season and easy to saw and work and gives warning before failure. Jand wood is not as good or as durable as babul. Its use is limited to a small number of planks.

9.5 Availability and Source of Wood Supply

Babul is supplied to the mining industry from Sind and Punjab. Bulk supplies are made by the private sector and few private miners depend on government forests for supply of mining timber.

Scattered babul plants and small sized plantations are also raised on farm lands in the Punjab. Standing babul plantations 5-10 years of age are purchased by the middleman who either supply the wood to the mining firms or bring the wood to the timber market where the traders grade and stock it. Representatives of the mining firms purchase timber as per their requirement from the market. Certain large sized mining firms purchase standing babul plantations from the farmers, arrange harvest and process and saw the wood on their own sawmills.

PMDC prefer to buy their requirements from governments forests as far as possible. Work of Khewra salt mines in 1988 remained suspended for some time because forest department could not supply them chil sleepers. There was no agreement between the forest department and PMDC for supply of chil. However PMDC prefer to obtain their requirements from the forest department by negotiations. Props sized wood is available from intermediary silvicultural thinnings but thinning are rarely carried out by F.D for want of funds. A small demand of PMDC was met with by the forest department as indicated in Table 15 as under:-

TABLE 15

DEMAND OF WOOD BY FMDC SUPPLY BY SIND FOREST DEPTT.

Year	Demand of FMDC		Supply by Sind Forest Deptt.	
	Fit Props M ³	Planks	Fit Props M ³	Planks M ³
1981-82	3,520	-	1,054	-
1982-83	4,450	1,755	785	131

SOURCE: Turkpak Survey - 1990

9.6 Wood Availability in Sind

The riverain forests of Sind cover an area of 240,000 ha. These are mainly stocked with babul. In addition 82,000 ha of irrigated plantations contain 60 percent babul. Thus the total stocked area of babul in Sind works out to 290,000 ha. 41000 m³ babul was extracted from this area during 1989: out of this 12744 m³ was sold for use as props and planks. Rest of the demand for mining timber was met with by the private sector/hurrie planters.

Sirhandi (1990) indicated that private sector supplied 96.5% of the total wood consumed in mining. Following table No.16 gives the details of mining wood supplied by Sind Forest Department, to miners.

TABLE 16
MINING TIMBER SUPPLIED BY SIND FOREST DEPARTMENT

Particulars	1986-87	1987-88	1988-89	1989-90
Production of Mining Timber by Sind Forest Department	1,420 Stacks 20,107 Cu.M.	735 Stacks 10,407 Cu.M.	1,470 Stacks 20,815 Cu.M.	900 Stacks 12,744 Cu.M.
Revenue earned from sale of Mining Timber	Rs 5.680 million	Rs 3.307 million	Rs 7.350 million	Rs 4.950 million
Sizes in which this timber is cut	<u>Particulars</u>	<u>Length M</u>	<u>Girth cm</u>	
	Babul Gattoo	1.7 x	25	
	Babul Gattoo	1.7 x	38	
	Babul Gattoo	2.3 x	38	
	Babul Gattoo	3.0 x	38	
	Babul Ballies	3.5 x	45	
	Babul Thap.	1.7 x	75	

Source: Office Record of Conservator of Forests,
(Hyderabad Sind)

9.7 Hurrie Plantations in Sind

The practice of raising 'hurries' has been in vogue in Sind since 1858. It was introduced by Sir Bartly Frere the then Commissioner of the province as an incentive to the farmers. At that time 4 ha of land was given free in addition to other concessions to the farming families to raise babul to meet the fuelwood requirements on one hand and to improve and develop the marginal lands on the other. Although the concessions such as free land, free water, remission of land

revenue are no longer available to the farmers, yet 'hurries' are being raised because it is a sound economic proposition. Not only the farmers get wood and fodder for their domestic use and for friends/relatives but also substantial cash income is realized by sale of surplus wood. Also land productivity is improved because babul is a nitrogen fixing tree. Agricultural crops grown on areas, which were previously occupied by babul plantations, give significantly higher yields than average.

'Hurries' are grown generally on undeveloped saline and waste lands, erosion prone "kacho" and high lying areas. Most of these lands have little alternative use. The only inputs required in 'hurrie' cultivation are land development and irrigation water supplies. The financial viability of 'hurries' is never in doubt. Also the landlord-tenant problems do not arise as the "hurries" are self cultivated. At present the financial returns from 'hurries" amount to Rs.7,320/= per ha over a rotation of 5 years or an income of Rs.1,464/= per acre per annum. The cost benefit ratio of babul cultivation is about 1:2 The total area of "hurries" in the districts of Hyderabad, Thatha and Sanghar is estimated as 5792 HA. It produces 57920 m³ of mining timber per annum. (Sheikh 1986)

C

'Hurrie' owners in Hyderabad supplied the following quantity of babul wood (table No.17 attached) to mine owners of Lakhra and Jnipmer in the past years.

In summary, the position of annual production and supply of mining timber in Sind is as under:

Wood from "hurries in the districts of Hyderabad, Thatha and Sanghar	= 57920
Wood from Government Forests	= 12744

TABLE 17

BABOOL SUPPLIED FROM HURRIES IN SIND TO
LAKHRA & JHIMPIR MINES (SIND)

<u>No.</u>	<u>SIZE</u> <u>Length(M)</u>	<u>DESCRIPTION</u>	<u>1984</u> <u>Girth</u> <u>BREADTH/</u> <u>HEIGHT(CM)</u>	<u>PIECES</u>	<u>QUANTITY</u> (m ³)
	3.6	BALLIES	30	150,000	3,980
	3.0	GATTO	30	100,000	2,265
	2.4	GATTO	30	175,000	2,549
	1.8	GATTO	30	75,000	1,058
	1.0	PLANKS	10x7	250,000	736
	1.2	PLANKS	10x7	250,000	1,019
TOTAL					11,587
<u>1985</u>					
	3.6	BALLIES	30	156,000	4,250
	3.0	GATTO	30	104,000	2,322
	2.4	GATTO	30	182,000	2,550
	1.8	GATTO	30	78,000	1,104
	1.0	PLANKS	10x7	260,000	765
	1.2	PLANKS	10x7	260,000	1,048
TOTAL					12,039
<u>1986</u>					
	3.6	BALLIES	30	174,000	4,670
	3.0	GATTO	30	116,000	2,555
	2.4	GATTO	30	203,000	3,420
	1.8	GATTO	30	87,000	1,219
	1.0	PLANKS	10x7	290,000	850
	1.2	PLANKS	10x7	290,000	1,161
TOTAL					13,875

CONTINUED...

CONTIUED FROM PREVIOUS PAGE (Table 17)
 BABOOL SUPPLIED FROM HURRIES IN SIND TO LAKHRA & JHIMPIR MINES(SIND)

YEAR 1987

SIZE LENGTH(M)	DISCRIPTION	Girth BREADTH/ HEIGHT(CM)	PIECES	QUANTITY (m ³)
3.6	BALLIES	30	2 10,000	5,650
3.0	GATTO	30	140,000	3,140
2.4	GATTO	30	245,000	3,980
1.8	GATTO	30	105,000	1,484
1.0	PLANKS	10x7	350,000	1,029
1.2	PLANKS	10x7	350,000	1,444
TOTAL				16,727

YEAR 1988

3.6	BALLIES	30	2 16,000	5,800
3.0	GATTO	30	144,000	3,250
2.4	GATTO	30	252,000	4,560
1.8	GATTO	30	108,000	1,529
1.0	PLANKS	10x7	360,000	1,188
1.2	PLANKS	10x7	360,000	1,484
TOTAL				17,811

E: Records of Deputy Director (Minerals), Govt. of Sind, Hyderabad

-	Wood from private farms in the rest of Sind including hurries and scattered trees	=	33254
	Total Availability	=	103920
-	Wood consumption in Sind Mines	=	25651
	Surplus	=	78269

This surplus is exported to Baluchistan

9.8 Wood Supply in Baluchistan

78271 m³ of wood was consumed in mining in Baluchistan in 1989. Little babulwood or other mining timber is produced in Baluchistan. Almost all of their demand of mining timber is met with from Sind. 78,000 m³ of surplus mining good in Sind, shown in the last paragraph is transported to Baluchistan for use in coal mines.

9.9 Wood Supply in Punjab.

28885 m³ of mining wood was consumed in the Punjab during 1989. Babul is raised over a small area in the south zone but it is used as firewood or furniture. Almost the entire demand of mining timber in the Punjab is satisfied by private tree planters. An insignificant quantity of "chir" is supplied to PMDC salt mines during certain years by the Punjab forest department.

9.10 Wood Supply in N.W.F.P.

Demand of mining good in NWFP is very small i.e 2698 m³ during 1989, bulk of this quantity comes from the Punjab, Kail, Chir, Pine and Kharlanja, in small quantities is obtained from within the province.

10. Timber Prices

Wood prices have risen very sharply in Pakistan in the past and are very high as compared to world standards. The timber prices in general show large irregular variations. Since 1956-57 timber prices have shown upward trend at an average rate of 12.35% per year. At a constant price index, prices have increased in real terms by 218% from 56-57 to 87-88 which works out to annual real increase of 3.93%. The pattern of price increase in Karachi, as shown in table 18 and annexures confirms this upward trend of wood prices.

TABLE 18
AVERAGE WHOLESALE PRICES OF TIMBER IN KARACHI
(Rs./M³)

Year	Babul	Chil
1976-77	1059.45	2030.61
1977-78	1206.60	2086.53
1978-79	1854.04	2439.68
1979-80	2413.20	3466.76
1980-81	2648.63	3737.51
1981-82	2501.48	3999.07
1982-83	2472.05	3354.93
1983-84	2472.05	3531.50
1984-85	2913.48	2621.30
1985-86	2736.91	3237.37
1986-87	1942.33	3060.63

SOURCE: "State of Forestry in Pakistan", Pakistan Forest Institute, Peshawar, 1988.

According to our survey, the average prices of babul wood used in mining were as under:

Prices of Mining Wood

Rs. Per M³

	<u>Props</u>	<u>Planks</u>
Sind	1000	910
Punjab	840	500
Baluchistan	1600	940
N.W.F.P.	1260	924

SOURCE: TURKPAK Survey 1990.

Prices of babul props and planks in our survey are less than the wholesale of babul timber in Karachi. This is because the mining timber is smaller in size than normal babul timber and a variety of taxes and expenses of wood import in Karachi make it more costly.

11. Substitutes of Wood in Mining

Use of wood for artificial supports in mining is a time consuming and difficult method: arrangements have to be made for purchase, transport, permits and replacement of wooden structures every year. These temporary supports have limited value. In foreign countries permanent supports of steel and masonry are constructed which are more expensive than wooden structures. However these steel structures save annual work of repairs and replacement. Habibullah mines in Pakistan imported elements of steel support from abroad at a cost of Rs.2.5 million in 1983-84. However these have not been installed or utilized till now due to technical problems. PMDC is processing a project for installation of permanent steel supports for their Lakhra and Jhampir mines. This project was not approved by the competent authority upto mid 1990.

12. Mining Work Force

In the mines which were surveyed, 9155 skilled, semiskilled and unskilled workers were employed during 1989, and were producing 1101,000 tonnes of coal. It is estimated that total coal production in 1989 was 3,953,000 tonnes, thus 32,870 workers were employed in coal mines. Khattak and Amjad (1981) have estimated one worker for timbering for 1000 tonnes of coal produced. Accordingly 5,000 workers out of 39,567 were doing timbering work. Almost all the timbering workers were temporary and part time and were employed on piece rate contracts. In Sind, Punjab and NWFP, labour works mostly in winter. In summer production is slowed down. Swat is an important source of labour.

The distribution of cost on wood labour and other items in coal mines is shown in the following table. Wood accounts for 10-25% of total costs. (Table 19)

TABLE 19
DISTRIBUTION OF COSTS ON WOOD,
LABOUR AND OTHER ITEMS

	Wood %	Labour %	Other Items %
Sind	13	46	41
Baluchistan	25	30	45
Punjab	15	60	25
N.W.F.P.	10	60	30

Source: TURKPAK Field Survey Data (1990)

In Baluchistan share of wood cost in the total cost component is comparatively high due to the factors explained in the paragraph 6.4.

13. Taxes

Advance income tax @ 3% is payable on purchases of wood made from the government agencies throughout Pakistan. The difficult procedure of refund makes it a permanent tax even for those traders who are outside the income tax bracket. The system of advance income tax provides facility of sustained tax collection to the central board of revenue. At the time of sale of wood, the concerned forest officer realizes 3 percent money on the value of wood purchased by an individual and pays the same to the income tax department. It is then upto-the purchaser/assessee to make final adjustment of tax with the concerned taxation officer. Without slight effort, the board of revenue get an income of 3 percent of the value of total volume of wood sold by the forest department. The system has two disadvantages. A substantial number of purchasers are petty traders artisans of wood. Their annual purchases rarely exceed Rs.100,000/= which yield a net profit much below the taxable ceiling. Although the advance tax is refundable in such cases yet the small traders have neither the resource - knowhow, nor time-money to pursue the almost impossible task of refund of tax. While bidding for the wood lots, the purchasers never loose sight of the advance tax which they have to pay over and above the bid price thus the provincial governments are deprived of their rightful income by 3 percent and the price of wood in the market is raised propotional.

District Council export tax is levied in all provinces except Baluchistan when wood and other commodities cross one district into others; Generally it is Rs.-/50 per quintal for firewood and Rs.3/= per quintal for timber and industrial wood. In actual practice the contractors of district council charge more than the schedule of rates. Municipal octori tax is

Another charge on wood. It was introduced in the sub continent about 200 years ago. Municipal rules 1964 imposed uniform taxes in all the units of the then West Pakistan. The average octroi tax schedule at present is as under:-

Timber	Rs. 4/= for quintal
Processed Wood	Rs.14/= -do-
Firewood	Rs. 1/= -do-

Shah (1990) stated that a large number of complaints were received by the government stating that municipal and district council contractors were charging taxes which were many times higher than the schedule of rates. Government has therefore introduced a system to deal with these complaints. The tax payer can approach the tax inspector, taxation officer, chairman municipal committee/district council or the commissioner for redress of his grievances.

In NWFP Rs.123/= per m³ has to be paid for transport of timber from one place to another, irrespective of its source, in addition to the above taxes.

14. Permits and Licences

Forest Act 1927, makes provisions for regulation of wood in transit. In Sind and Jhelum-Rawalpindi districts of Punjab a transit pass is necessary for transport of wood from one place to another. This permit is issued by the district forest officer (DFO) free of any charge. The Sind DFO issues the T.P. (Transit Pass) on the basis of an NOC (no objection certificate) issued by Mukhtiarkar and the agreement deed executed between the land owner and purchaser of timber. Site is also inspected by representative of the forest

Department who verifies the bonafides of wood. For movement of timber outside the province, conservator of forests issues the transit pass. No fee is charged for this export out of the province. In NWFP a fee of Rs.123/= per m³ for timber and Rs.50/= per truck of firewood is charged for transport of wood from one place to another irrespective of the source i.e. farm lands, government forests, imports from abroad, tribal areas and Afghanistan. Felling of trees in Rawalpindi District (Punjab) and all areas within 8 k.m. radius of international border requires the permission of the competent authority (Act 1975). Apparent advantage of the system of transit passes (TP) is that bonafides of the wood meant for transport are verified. By this mechanism illicit felling from the forest is reduced and forest protection improves. In actual practice, TP system has little effect on wood thefts. Not only thousands of damage reports of wood theft are issued by the forest staff but also the number of these offences increases every year. The tree planter/farmer is deprived of the full tangible benefits of his tree crop due to imposition of restrictions on transport/felling. These restrictions serve little useful purpose but are disincentives to raise more trees. In case the government wants to regulate tree felling on private areas for soil conservation/protection, the private tree planter should be compensated for the loss incurred by him. Similarly, the TP system is justified only if with its imposition, illicit felling and thefts are completely eliminated.

15. Problems/Constraints

15.1 Law and Order

Law and order situation in the country in general and in Sind in particular has seriously effected the industry, mines, transportation, trade and every aspect of economic activity.

It is evident that in this situation industrial and mineral production suffers. Baluchistan and Sind are the two main coal producing provinces in Pakistan. In the firms surveyed, the coal production declined from 881000 tonnes in 1988 to 851000 tonnes in 1989. In Sind, the production was stagnant at 688000 tonnes in 1988 and 1989. Whereas increase/decrease of coal production is the function of supply and demand, the law and order situation has its own effect on the output.

15.2 Permits and Transit Passes

The system of obtaining permits and transit passes is very difficult. Ban on tree cutting in certain parts of the country is a constraint in the smooth supply of wood. Similarly obtaining NOCs from revenue authorities for transit of wood is a big hurdle in the movement and supply of wood. The representatives of the mine owners and the wood dealers have to spend substantial time, energy and money to procure such permits.

15.3 Avoidable expenses

In theory, transit passes on movement of wood and timber in Sind and Jhelum/Pindi districts of Punjab are granted free of charge by the forest departments. In practice, significant expenditure is incurred by wood dealer on travel, verification from revenue authorities and obtaining TP from the forest department. Similarly obtaining permission of the competent authority to cut trees from propriety lands within 8 km radius of border (under act 1975) or in Rawalpindi district (Punjab) (under rules of Forest Act 1975) is a time consuming exercise which involves hidden expenses. A number of check posts set up by the forest/police departments at Chowk Mari,

Sukkur and Jacobabad (Sind) Turnaul, Jhelum, Murree (Punjab) Khairabad, Peshawer, Abbotabad (NWFP) cause considerable botheration to wood transporters in addition to financial burden of varying extent. All this avoidable expenditure adds to the high cost of wood.

15.4 Wood Availability

In general it may be stated that supply of mining timber is not a constraint in the smooth functioning of private mines. None of the private miners, interviewed in the survey, complained about the availability of wood. However wood is in short supply during the rainy season and floods due to problems of transport. PMDC which operates rock salt mine at Khewra complained about the non-availability of chil timber from the forest department for their railway sleepers. They stated that their transport operations remained suspended on this account in 1989. PMDC Hyderabad failed to get babul props and planks from the forest department in 1981-82 and 82-83. However adequate supplies were available to them from the private sector.

16. Recommendations

16.1 Demand for mining timber is expected to increase from 135,505 m³ in 1989 to 307,000 m³ in 2110 due to increase in production of COAL and other minerals. A major part of this demand is supplied by the private sector. The present restrictions on movement and felling of timber appear to be harsh. It is doubtful if these restrictions have any effect (good, bad or otherwise) on stopping theft of wood from the Government owned forests/lands. It is recommended that the existing restrictions be relaxed so as to minimize the chances of misuse of powers.

16.2 There is also a need to stream-line the large number of taxes imposed on wood. It is strongly recommended that small dealers who are outside the Income Tax bracket should be exempted from the payment of advance tax because it is never refunded. District council export tax and union council tax be waived. If this cannot be done, sound arrangements should be made so that the contractors appointed to realize these taxes do not overcharge the wood dealers.

16.3 "Hurrie" planters are doing a lot on their own to raise babul plantations and meet the demand of miners. Government has not paid any attention to this important discipline so far. There is a need to help the private sector by launching an agro-forestry program in the forest department of all provinces. Technical advice on raising and marketing babul trees on farm lands may be provided alongwith better quality seed, sound planting stock and irrigation water. Agro-forestry cells in the provincial forest departments would be responsible to protect the farmers from illegal demands and avoidable expenses as well as the administrative excesses of permit issuing authorities.

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Average annual wholesale prices of timber at
Karachi market

Year	(Rs./m ³)			
	Shisham	Diar	Partal	Chir
1970-71	594.35	859.21	629.67	-
1971-72	590.11	896.30	622.60	-
1972-73	637.08	971.16	622.16	-
1973-74	803.41	1118.42	827.07	-
1974-75	1412.60	1618.48	1212.36	-
1975-76	2232.96	2677.93	2012.95	-
1976-77	2383.76	2913.48	2295.48	2030.61
1977-78	2678.05	3237.21	2363.16	2086.53
1978-79	3119.49	3825.79	2216.02	2439.68
1979-80	4708.67	4708.67	3095.95	3466.76
1980-81	5002.96	4649.81	3178.35	3737.51
1981-82	4473.24	4296.66	2678.06	3399.07
1982-83	4514.38	4414.38	2473.72	3354.93
1983-84	3296.07	4414.38	3001.78	3531.50
1984-85	3266.64	4907.31	3354.92	3621.30
1985-86	3678.64	5679.83	3354.92	3237.37
1986-87	3590.36	6238.98	4090.65	3060.63
1987-88	3708.07	6533.28	4414.38	3178.35

Year	(Rs./m ³)		
	Babul	Gurjan	Tenk
1970-71	-	-	-
1971-72	-	-	-
1972-73	-	-	-
1973-74	-	-	-
1974-75	-	-	-
1975-76	-	-	-
1976-77	1059.45	2207.19	6709.85
1977-78	1206.60	2795.77	8593.32
1978-79	1854.04	3246.04	10550.36
1979-80	2413.20	4267.23	12065.96
1980-81	2648.63	4767.53	14567.44
1981-82	2501.48	4532.10	14626.29
1982-83	2472.05	4767.53	14744.01
1983-84	2472.05	5473.83	18089.94
1984-85	2913.48	6055.05	18282.87
1985-86	2736.91	6753.99	25161.94
1986-87	1942.33	6798.13	33254.96
1987-88	1942.33	7224.85	35315.00

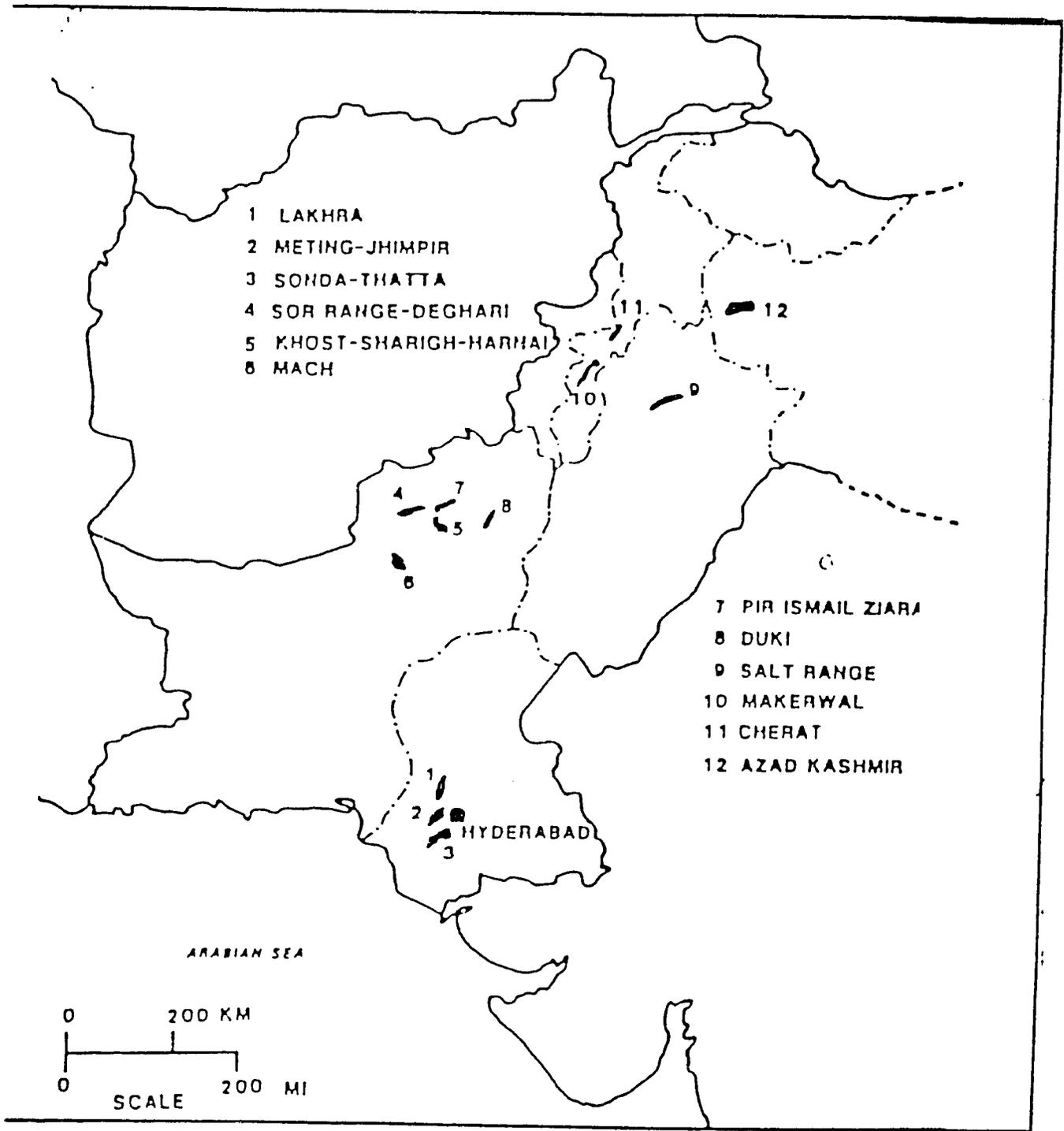
Source: 1. 10 Years of Pakistan in Statistics, 1972-82.
2. Pakistan Statistical Year book, 1985, 1986, 1987, 1988 & 1989.

Source: "State of Forestry" (1989) Published by Pakistan Forest Institute, Peshawar.

Average sale rates of shisham and mulberry
timber at Changa Manga sale depot

Species Class Year	(Rs. per cubic metre)							
	Shisham			Mulberry				
	IR	IIR	IIIR	IR	IRR	IIR	IIRR	IIIR
1972-73	848	611	454	932	525	461	326	265
1973-74	1023	745	586	1045	738	718	562	281
1974-75	1236	936	542	1010	756	618	425	427
1975-76	1441	1061	559	1275	815	850	466	457
1976-77	1443	1029	677	1175	843	823	535	402
1977-78	1594	1289	862	1190	874	814	544	366
1978-79	2295	1589	1059	2543	2190	1766	1589	833
1979-80	3037	2119	1130	3002	2366	2330	882	529
1980-81	3460	2401	1412	4025	2330	1836	1236	600
1981-82	4167	2719	1766	5049	3672	3001	1483	636
1982-83	5579	3390	1977	4308	2931	2366	1377	636
1983-84	6603	3531	2119	5296	3531	3213	1483	777
1984-85	8087	3885	2401	5897	4450	4979	2119	953
1985-86	10171	4096	2613	5615	3637	3461	1695	1377
1986-87	11754	5057	2596	5629	3661	3383	1872	1413
1987-88	12376	6066	3001	4961	3689	2983	1859	1412
1988-89	14504	8536	3687	5119	3654	3037	1889	1394

Source: Data supplied by Divisional Forest Officer, Changa Manga.



LOCATION OF PAKISTAN COALFIELDS

LIST OF MINES IN PAKISTAN

COAL MINES (PUNJAB)

1. Dandoot
2. Kallar Khar
3. Choa Saiden Shah
4. Dhariala
5. Lahri
6. Basharat
7. Lilla
8. Malot
9. P. D. Khan
10. Diljaba
11. Khewra
12. Jogi Tilla
13. Skesar
14. Ucinhli
15. Hyatul Mir
16. Sodi Jaiwali
17. Pail
18. Katha
19. Makarwal
20. Kalabagh
21. Mari Indus

ROCK SALT MINES (PUNJAB)

22. Khewra
23. Dandoot

- 24. Warcha
- 25. Nilawan

COAL MINES

SIND

- 26. Lakhra
- 27. Meting
- 28. Jhampir
- 29. Sonda (Thattha)

BALUCHISTAN

- 30. Sor Range
- 31. Khost Sharig
- 32. Degari
- 33. Mach
- 34. Suigidi
- 35. Pir Ismail Ziarat
- 36. Abi-Gum
- 37. Duki

N.W.F.P.

- 38. Cherat
- 39. Makarwal

LIST OF FIRMS SURVEYED
WOOD CONSUMPTION IN MINING

PUNJAB

1. Katha Collieries (Pvt) Ltd; Katha District, Khushab.
2. Jhelum Valley Coal Co; Aroda Section, Katha, District Khushab. (Private)
3. Malik Allah Bukhsh Sangha (Pvt) Ltd; Khushab. (Private)
4. Pakistan Mineral Development Corporation, Dandot, District Chakwal. (Public)
5. M/s Khan Coal Mines, Dandoot District, Chakwal. (Private)
6. M/s Ghandhala Mineral Company (Pvt) Ltd; Chakwal. (Private)
7. M/s Super Punjab Coal Mines Dandoot District, Chakwal. (Private)
8. Pakistan Mineral Development Corporation, (Salt) Khewra. (Public)
9. Pakistan Mineral Development Corporation, Makarwal, Mianwali, Gulberg-III, Lahore. (Public)
10. The Wah Stone & Lime Quarry, Dandoot District, Chakwal. (Private)

N.W.F.P.

11. Pakistan Mineral Development Corporation, Makarwal, Gulberg-III, Lahore. (Public)

SIND

12. M/s Indus Coal Mines Unit No.6, Latifabad, Hyderabad. (Private)

13. M/s National Coal Mines (Pvt) Ltd; 625-B Unit-7, Latifabad, Hyderabad. (Private)
14. PMDC Coal Mines, 18-A Unit-7, Latifabad, Hyderabad. (Public)
15. M/s Amin Coal Mines (Pvt) Ltd; Near Moti Mahal, Street No.1, Hyderabad. (Private)
16. M/s Habibullah Coal Mines (Pvt) Ltd; Opposite Homstate Hall, Hyderabad. (Private)
17. M/s Delux Coal Mines Near Petrol Pump Railway Crossing, Hyderabad. (Private)
18. H. M. Iqbal Coal Mine (Pvt) Ltd; 7-D, Latifabad, Hyderabad. (Private)
19. M/s Faiz Coal Mines (Pvt) Ltd; 39-D.C.Road, Thndi Sarak, Hyderabad. (Private)
20. M/s Baluchistan Coal Mines (Pvt) Ltd; Opposite Police Station, Unit NO.9, Main Road Latifabad, Hyderabad. (Public)

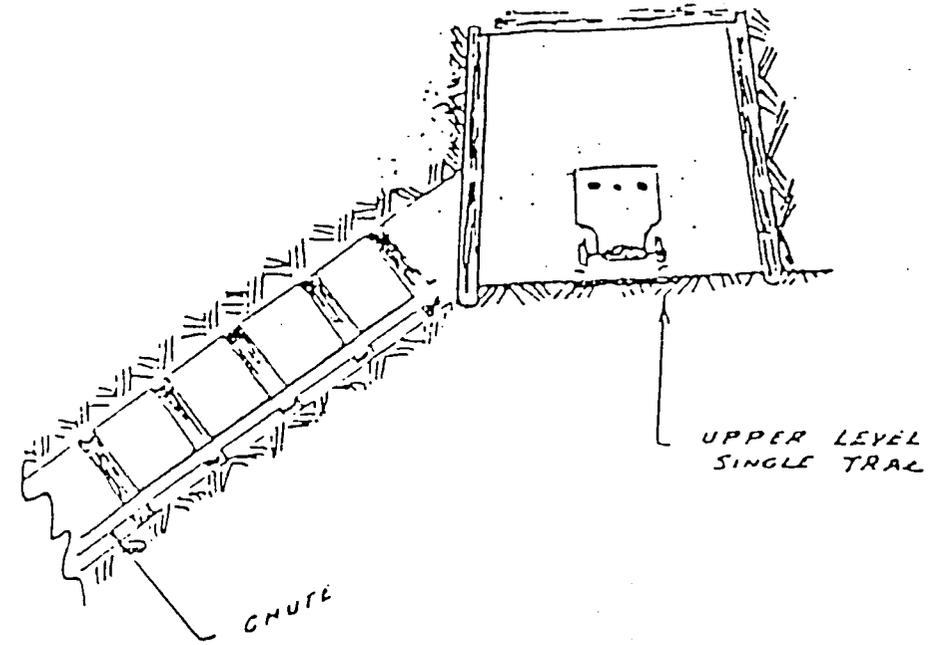
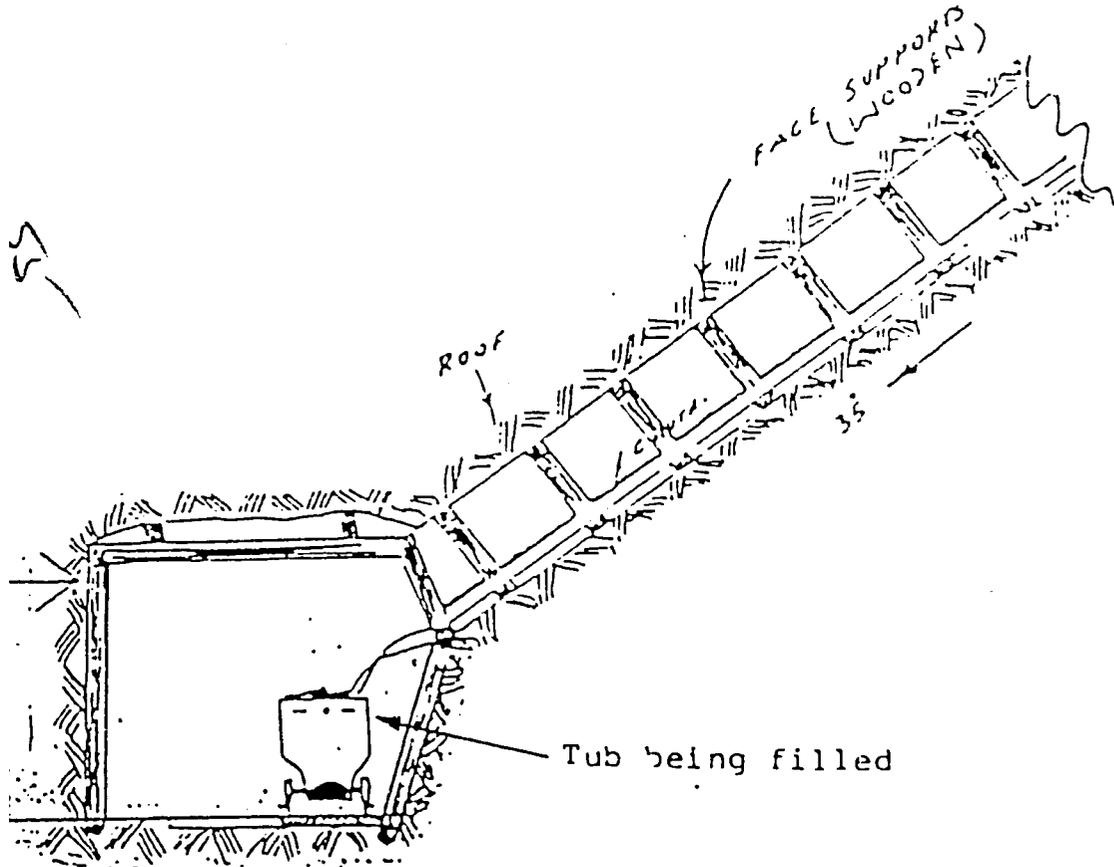
BALUCHISTAN

21. M/s S. M. Usman Khan, Jomezai & Company, Sorrang, Jinnah Road, Quetta. (Private)
22. M/s Islam Coal Company, sorrang, Ingle Road, Quetta.
23. M/s Habibullah Mines Limited, Degari, Quetta. (Private)
24. M/s Marri Coal Company, Ziarat Stewart Road, Quetta. (Private)
25. M/s Mir Coal Company, Ziarat, Ingle Road, Quetta. (Private)
26. M/s Ahmed & Company, Ziarat, 2-13/4, Share-Adalat, Pir Ismail Ziarat. (Private)

27. M/s Kallat Ittehad Company Degari Stewart Road, Quetta.
(Private)
28. M/s Malik Willayat Hussain & Sons Ltd; Sharigh.
(Private)
29. M/s United Minerals Company, Sorrang; Court Road,
Quetta. (Private)
30. M/s Habibullah Mines Limited, Jinnah Road, Quetta.
(Private)

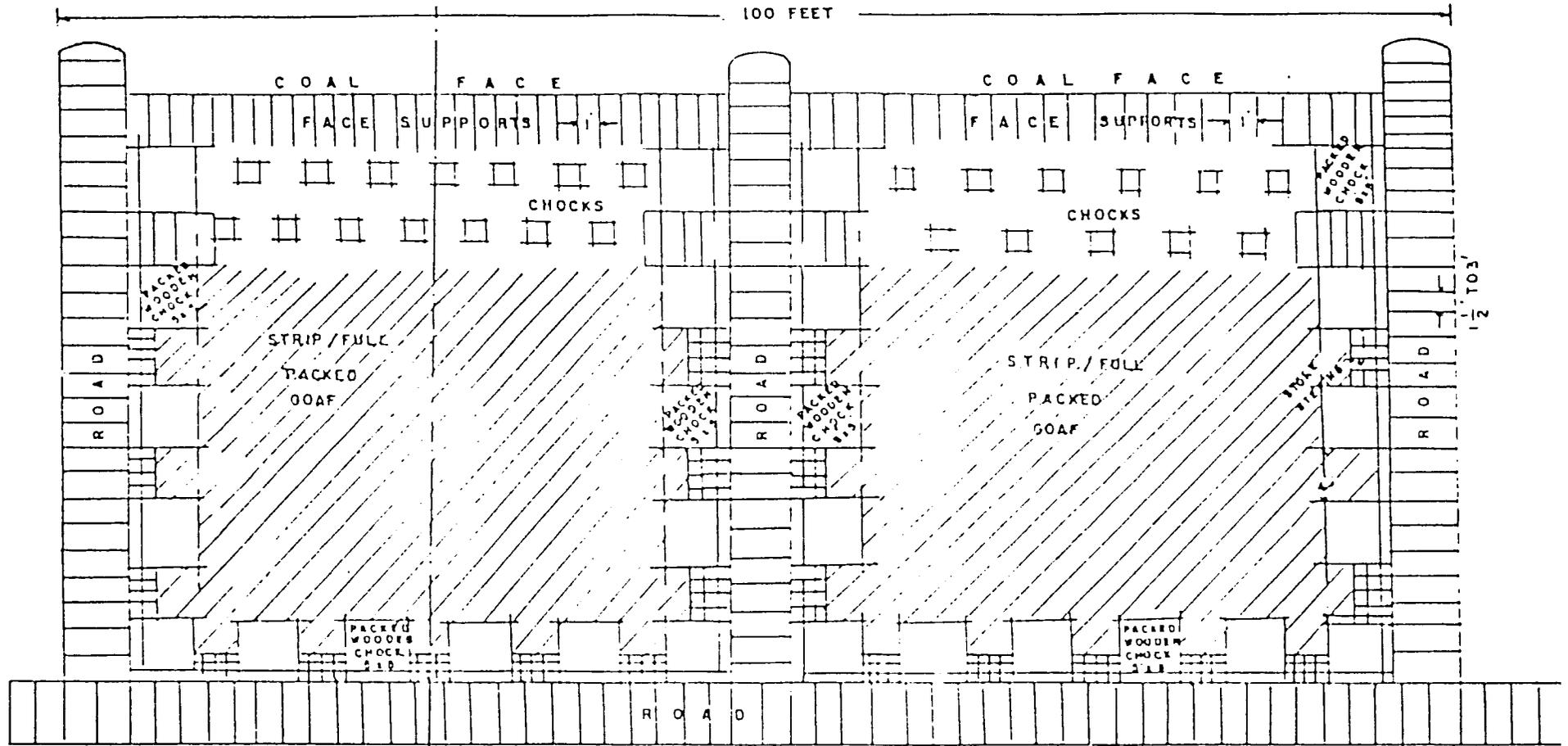
OFFICERS INTERVIEWED

1. Mr. Noor Din Khan Afghan, Director, Mineral Department, Karachi.
2. Assistant Director of Coal Production Department, Karachi.
3. Mr. Bashir A. Ansari Chief Mine Inspector Near Saddar, G.P.O. Karachi.
4. Geologist-PMDC-Bhutto House-Karachi.
5. Conservator of Forests Farm Forestry Karachi.
6. Divisional Forest Officer Khipro at Karachi (Imdad Ali)
7. Mr. Memon, Deputy Director Mining Department, Hyderabad.
8. Mr. Allah Din Kirio Assistant Director (Coal) Mineral Department, Hyderabad.
9. Mr. Afzal Haq Conservator of Forest, Hyderabad.
10. Mr. Mohammad Iqbal Junejo, Divisional Forest Officer Utilization Hyderabad.
11. Project Manager P.M.D.C. Latifabad, Hyderabad.
12. Director Minerals, Sarhad Development Authority, Peshawar.
13. Project Manager, P.M.D.C., Peshawar.
14. Mr. Abdul Majid, Chief Mining Engineer, P.M.D.C. Khewra, Salt Mine, Khewra.
15. Syed Zaheer Hussain Shah, Deputy Secretary (Regulations) Local Government Department, Lahore.



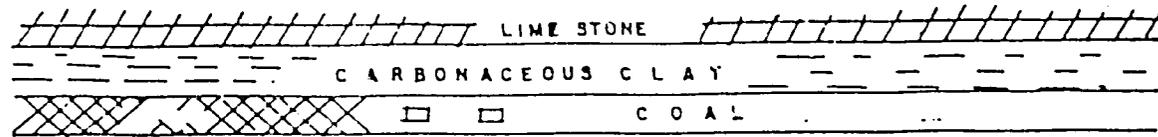
A TYPICAL SECTION OF LONGWALL FACE
 IN THIN SEAM.
 (MAKERVAL AND GULLA KHEL AREA)

SCALE: - 1" = 10'



SECTION A-B

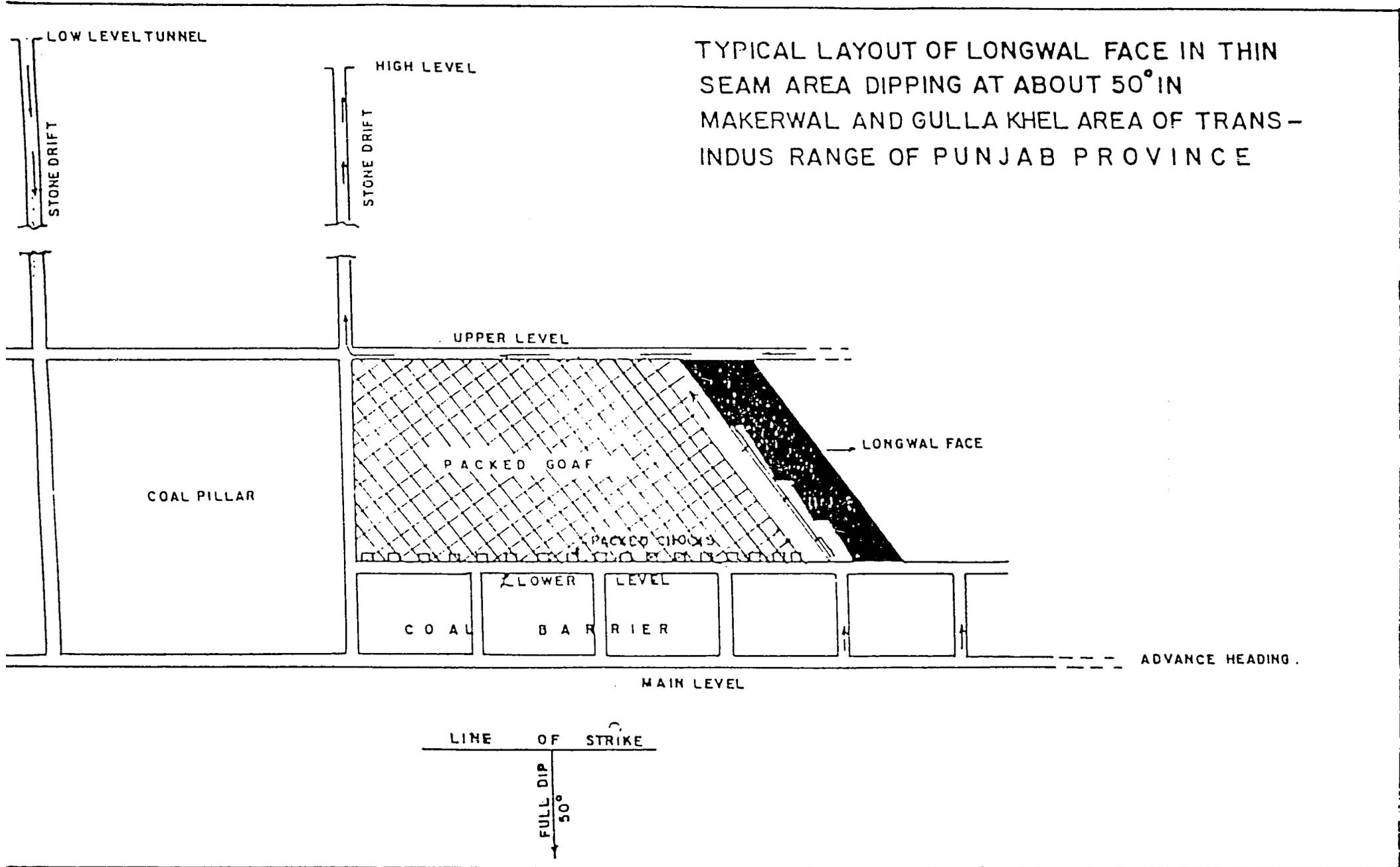
SCALE 1" = 20'



SOMAHRI CLAYS

25

TYPICAL LAYOUT OF LONGWAL FACE IN THIN SEAM AREA DIPPING AT ABOUT 50° IN MAKERWAL AND GULLA KHEL AREA OF TRANS-INDUS RANGE OF PUNJAB PROVINCE



LOW LEVEL TUNNEL

HIGH LEVEL

UPPER LEVEL

COAL PILLAR

PACKED GOAF

LONGWAL FACE

PACKED CHOCKS

COAL

LOWER

LEVEL

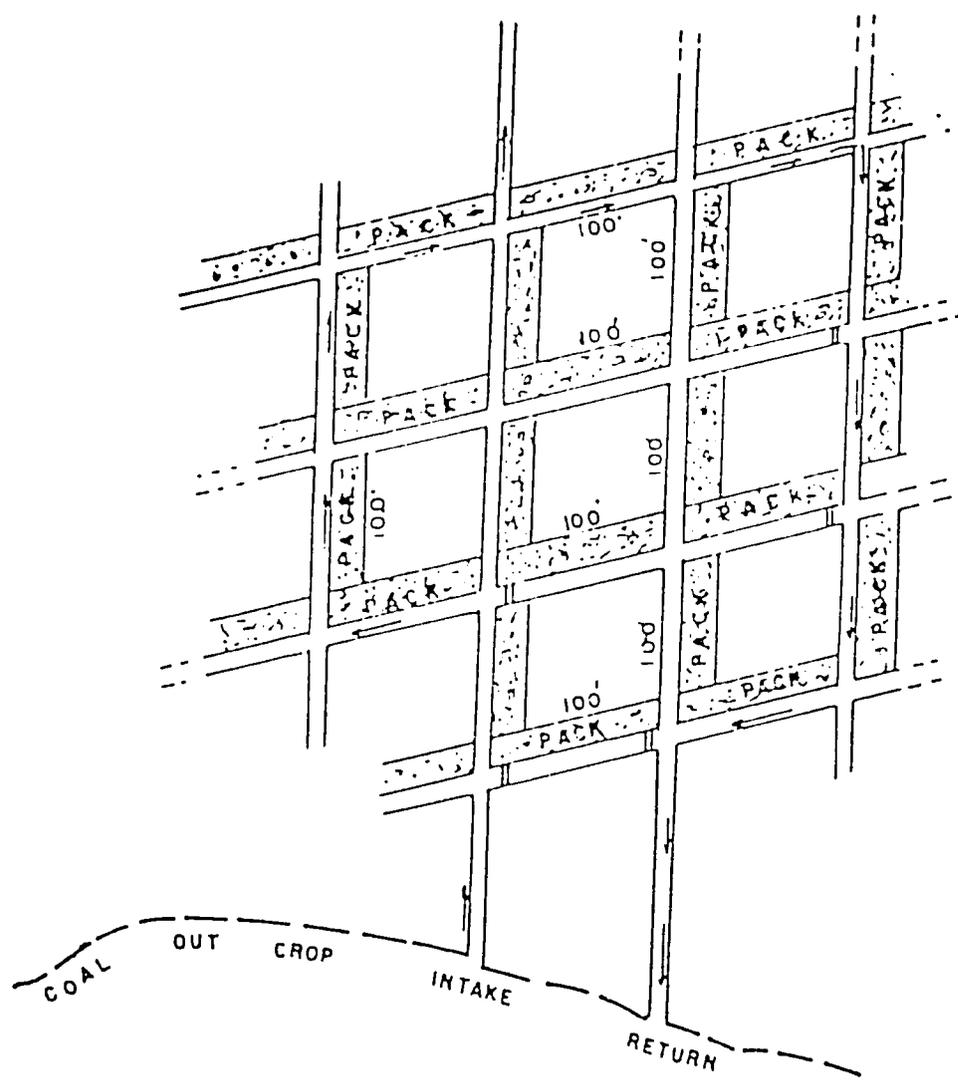
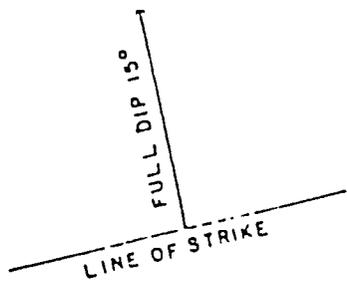
BARRIER

ADVANCE HEADING

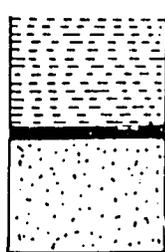
MAIN LEVEL

LINE OF STRIKE

FULL DIP
50°



SECTION OF PACK



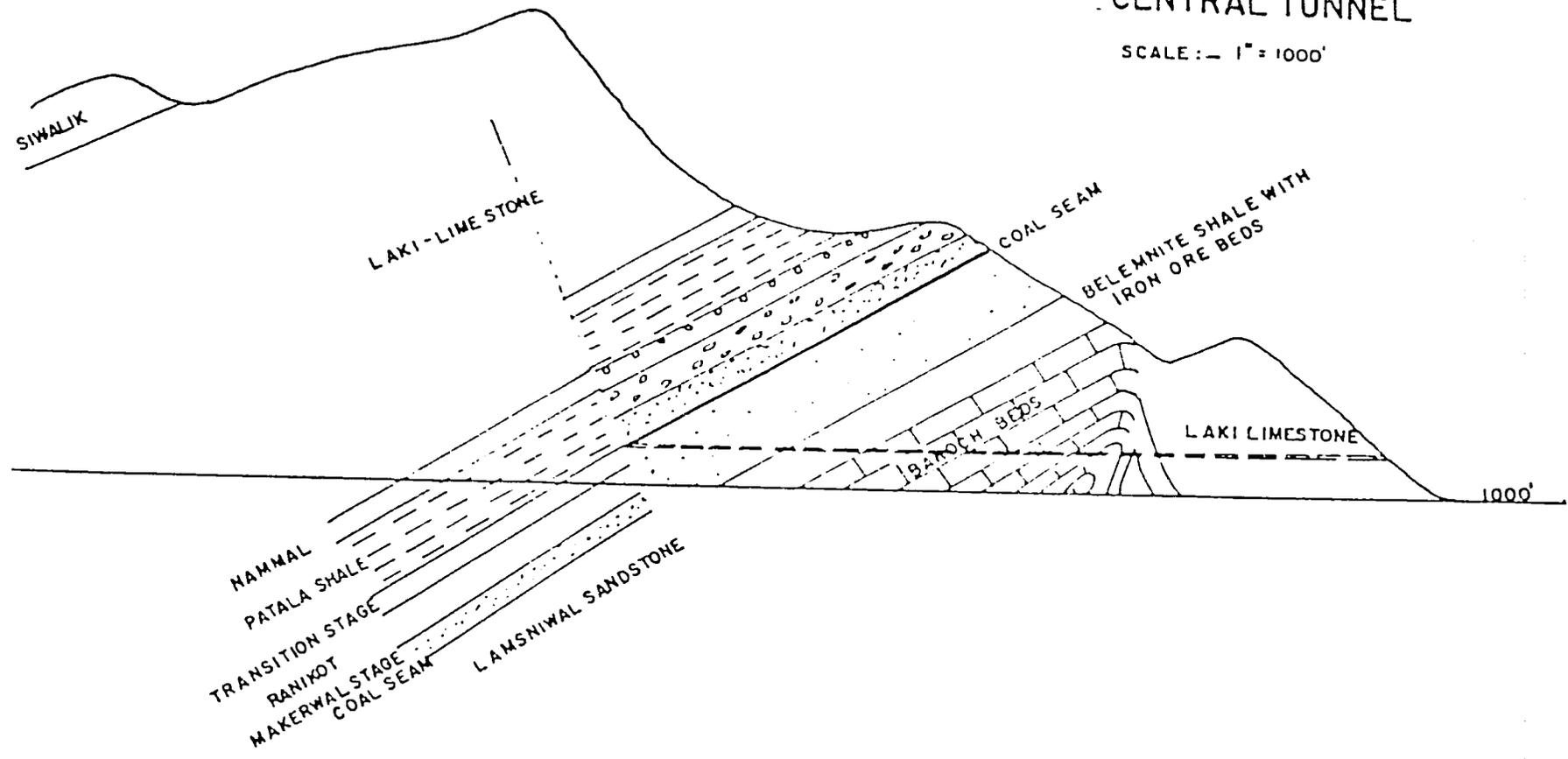
500 OVER BURDEN (DIFFERENT STRATA)
 MEDIUM TO FINE GRAINED STONE
 COAL 2' TO 3'
 COURSE GRAINED SAND STONE

TYPICAL ROOM AND PILLAR
 METHOD IN THIN SEAMS OF MAKERWAL
 AND GULLA KHEL AREA

— SIZE OF GALLERY 7'x7'

CROSS SECTION AT MAKERWAL ACROSS CENTRAL TUNNEL

SCALE :- 1" = 1000'



WOOD USING INDUSTRIES OF PAKISTAN
WOOD CONSUMPTION SURVEY QUESTIONNAIRE
MINING INDUSTRY

Serial No. _____
Date _____

1. Name and Address of the firm

2. Year the firm was established _____

3. What was the Annual Production of your four primary products:

Product Type	No. Produced per Year		
	1987	1988	1989 (Units?)
#1.			
#2.			
#3.			
#4.			

4. What Per Cent of Capacity are you operating at? _____

5. Since 1986, what are the actual wood requirement of the four main wood raw materials that you use.

Species	Initial Form of Wood Used:	Source of Raw Material (Private, Govt, Import)	Wood Volume Used				Units
			1987	1988	1989	1990	
#1.							
#2.							
#3.							
#4.							

* (scants, log wood, branch wood, lumber, etc.)

Page 2 - Mining Questionnaire

6. How is wood delivered to your factory? (Please Check all that apply)

<input type="checkbox"/> Railway	<input type="checkbox"/> Waterway
<input type="checkbox"/> Truck	<input type="checkbox"/> Push cart
<input type="checkbox"/> Animal cart	<input type="checkbox"/> Hand carried
<input type="checkbox"/> Other (_____)	

7. How much do you pay for wood raw material per unit delivered at the factory gate for the four primary species and grades used. For up to two other species, if these woods were available, how much could you use and what price would you be willing to pay for it.

<u>Species</u>	<u>Grade</u>	<u>Local Rs/Unit</u>		<u>Imported Rs/Unit</u>
		<u>Farm lands</u>	<u>State lands</u>	

Current Use:

#1.

#2.

#3.

#4.

Potential Use:

#1.

#2.

8. Are your average per unit wood costs the same as last year?

Choose one:

UP	+	_____	%
THE SAME		00	%
DOWN	-	_____	%

9. From whom is wood purchased? _____

(Tree grower, forest auction, middle man, own lands, etc.)

10. If your primary supplier is an individual please list his name and address here:

Page 4 - Mining Questionnaire

16. What is your gross annual value of sales in Rs? _____
17. How many man-years of employees does your establishment employ in an average year?
(Include all managers, professionals, staff, and laborers)
_____ man-years
18. Please note any other relevant information from the interview not covered elsewhere in the questionnaire.
(Use reverse side if necessary)

WOOD CONSUMPTION IN MINING
SUMMARY OF RESPONSES FROM THE FIRMS SURVEYED

In all 30 firms were surveyed; 29 were coal mining firms and one was salt mining firm.

Coal Production

29 coal mining firms were surveyed in Pakistan. The data furnished by 3 firms was unreliable and was excluded. The total coal production of 26 firms surveyed was 9,82,00 tonnes in 1987, 10,40,000 tonnes in 1988 and 11,01,000 tonnes in 1989.

In Sind, 8 mines produced 5,79,000 tonnes of coal in 1987, 6,88,000 tonnes in 1988 and 6,88,000 tonnes in 1988 and 6,88,00 tonnes in 1989.

In Baluchistan 9 mines produced 1,88,000 tonnes of coal in 1987, 1,93,000 tonnes in 1988 and 1,63,000 tonnes in 1989.

In Punjab 8 mines produced 2,00,000 tonnes of coal in 1987, 2,09,000 tonnes in 1988 and 2,36,000 tonnes in 1989.

In N.W.F.P. coal production of one mine was 21,000 tonnes in 1987, 16,000 tonnes in 1988 and 14,000 tonnes in 1989.

Capacity of Coal Production

8 coal mining firms in Sind were working at 86% of their capacity.

9 coal mining firms in Baluchistan were working at 82% of their capacity.

Sizes of Props and Planks

In Sind the prevalent sizes of props used are 1.8 meter x 25 cm, 2.1 meter x 28 cm, 2.7 meter x 30 cm, 3 meter x 34 cm, 3.6 meter x 37 cm. The size of planks is uniform as 1.2 meter x 10 cm x 4 cm.

In Baluchistan, prevalent size of props used are 1.7 meter x 28 cm, 2.1 meter x 28 cm, 2.7 meter x 30 cm x 36 cm x 37 cm and sizes of planks are 1.2 meter x 10 cm x 24 cm, 1.5 meter x 10 cm x 4.5 cm.

In Punjab and N.W.F.P. the common sizes of props used are 0.6 meter x 13 cm, 1.2 meter x 30 cm, 1.5 meter x 32 cm, 1.8 meter x 36 cm, 2.1 meter x 36 cm. Two sizes of planks used are 1.2 meter x 10 cm x 4 cm and 1.22 meter x 12 cm x 2.5 cm.

Mode of Transport of Wood

Wood is carried by trucks from the wood market to the mines by 28 firms out of 30 firms surveyed. One firm transported part of its wood by truck and a part by railway. Only one firm used animal cart for carriage of wood.

Wood Wastage

The wood purchased for use in the coal mines is not always exactly of the same size as required. Its ends have to be sawn off so that the pits and props fit in properly. The odds and ends which are sawn off are generally used by the workers as fuelwood for cooking and other purposes. It was estimated during the survey that 2478 m³ wood in the 26 coal mines surveyed was sawn off and used as fuelwood.

8 coal mining firms in the Punjab were working at 75% of their capacity.

One coal mine in N.W.F.P was working at 85% of its capacity.

History of Mining Firms

Out of 29 mines, surveyed one was started in 1921; for the next two decades there was no new mining firm, however one firm was established in 1940 during the World War II.

After independence 9 more mining firms started functioning during 1950-55.

No new firm came into existence from 1955 to 1961. 9 more mining firms were started during 1961-68. Five coal mining firms were established during 1970-78 and 4 coal mining firms were established during 1980-84.

Wood Consumed

The total wood consumed in 26 coal mines was 27,972 m³ in 1987; 28,955 m³ in 1988 and 30,960 m³ in 1989.

In Sind 8 coal mines consumed 14,300 m³ wood in 1987, 14,990 m³ in 1988 and 16,067 m³ in 1989.

In Baluchistan 9 coal mines consumed 6,975 m³ in 1987, 7,238 m³ in 1988 and 7,318 m³ in 1989.

In Punjab 8 coal mines consumed 6,060 m³ wood in 1987, 6,249 m³ in 1988 and 7,150 m³ in 1989.

In N.W.F.P wood consumption in one coal mine was 636 m³ in 1987; 478 m³ in 1988 and 424 m³ in 1989. C

In Sind 1177 m³ wood in 8 coal mines was cut off and used by the labour for cooking.

In Baluchistan 9 coal mines used 539 m³ of such waste wood as fuel.

In the Punjab wastewood was 720 m³ in 8 mines and in N.W.F.P. 42 m³ in one mine.

Source of Wood

27 out of 30 firms obtained mining timber from the middlemen, one firm purchased wood from the open market.

The biggest firm i.e Habib Ullah and Co; purchases wood from the tree growers directly and then processed the same on its own saw mills. Khewra salt mine, purchased its wood requirement from the forest department. Other PMDC mines too tried to obtain their wood demand from the forest department. If wood was not available in the government stock, they purchased it from the middlemen or wood market.

Other equipment used

Safety lamps, exhaust fans, water pumping sets, machinery for haulage of minerals saws-axes for conversion of wood into proper sizes is the other equipment used.

Distribution of Cost

In Pakistan the cost of wood used in mining was 16%; labour 49% and other costs 35% of the total cost.

In Sind the cost of wood was 13%; labour 41% and other costs 46% of the total cost.

In Baluchistan the cost of wood was 25%; labour 30% and other costs 45% of the total cost.

In the Punjab the cost of wood was 15%; labour 60% and others 25% of the total cost.

In N.W.F.P. the cost of wood was 10%; labour 60% and other costs 30% of the total cost.

Annual Gross Income

The total gross income of 26 coal mines surveyed in Pakistan was Rs 445 million in 1989.

The gross income of 8 coal mines in the Punjab was Rs 128.5 million in 1989.

The gross income of 9 coal mines in Baluchistan was Rs 95.5 million in 1989.

The gross income of 3 coal mines in Sind was Rs 206.8 million in 1989.

The gross income of one coal mine in NWFP was Rs 14.3 million in 1989.

Number of Employees

Total number of employees/workers in 26 coal mining firms surveyed was 9155 in Pakistan.

In Baluchistan 2813 workers were employed in 9 coal mines.

In Punjab 1666 workers were working in 8 coal mines.

In N.W.F.P. 324 workers were working in one coal mine.

In Sind 449 workers were employed in 3 coal mines.