

TOWARD A SUSTAINABLE COAL SECTOR IN CHINA

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(ESMAP)

Contents

Acknowledgments	xi
Abbreviations and Acronyms	xiii
Foreword.....	xvii
Executive Summary.....	xix
Institutional framework.....	xix
Key Issues.....	xx
Safety and Health	xx
Environmental Protection.....	xx
Restructuring and Rationalization.....	xx
Supply Shortages	xxi
Investment in Coal Mining	xxi
International Comparison.....	xxii
Australia	xxii
United States.....	xxii
Japan and the United Kingdom	xxii
Conclusions and Recommendations	xxiii
1. Review of The Institutional And Regulatory Framework.....	1
Administrative Organization of the Coal Mining Sector.....	3
State-Level Administration	3
Provincial and Local Government-Level Administration	5
Assessment of the Current Coal Sector Administrative System.....	5
Approval Procedures for Coal Mine Development.....	6
Acquisition and Transfer of Exploration and Mining Rights	6
Approval of Land Use for Coal Mine Construction.....	7
Approval of Coal Mine Construction	8
Standards for Coal Mine Design.....	10
Supervision and Monitoring of Coal Mining Operations.....	11

Coal Production and Marketing Controls.....	11
Coal Mine Safety and Health Supervision.....	12
Supervision of Small Coal Mine Operations.....	13
Fiscal Aspects.....	14
2. Key Issues.....	17
Safety and Health in coal Mine.....	17
Safety Regulation of Small Mines.....	19
Community and Occupational Health.....	20
Environmental Protection.....	21
Environmental Impact of Small Mine Operations.....	23
Weaknesses in Coal Mining Sector Environmental Protection.....	24
Cleaner Coal Use.....	25
Restructuring and Rationalization.....	26
Consolidation and Transformation of Small to Large Mines.....	27
Local Economic and Social Impact.....	29
Mine Closures.....	30
Rationalization of Labor.....	34
Full Private Ownership.....	34
Supply Shortages.....	35
3. Investment in Coal Mining.....	37
Investment Needs.....	37
Domestic and Foreign Investment in the Coal Sector.....	38
Domestic Funding for New Coal Mine Projects.....	38
Foreign Investment in Coal Mining in China.....	39
Barriers to Investment.....	41
Incentives and Factors Impacting the Investment Climate.....	44
Power Sector Reform and Development.....	44
Rail Transport.....	45
Coalbed Methane Recovery and Utilization.....	46
4. International Comparison.....	49

Perspectives.....	49
Technological Background	49
Coal Mining Sector Administration	51
Coal Resource Administration	52
Approval Procedures for Coal Mine Exploration and Development ...	53
Safety and Health	53
Environmental Protection.....	54
Mine Closures	55
Promotion of Investment.....	55
5. Conclusions and Recommendations	57
Enforcement of Laws and Regulations.....	58
Coal Sector Rationalization	60
Improvement of the Investment Climate.....	62
Issues for Further Discussion	64
Annex 1 : Regulations and Documents Pertaining to Coal Mining in China.....	67
Administration of Coal Resources, Reserves, and Exploration	67
Acquisition and Transfer of Exploration and Mining Rights	68
Major Documents Required for Approval of Coal Mine Construction	70
Current Coal Mine Design Standards In China.....	72
Acquisition of a Coal Production License.....	73
Laws And Regulations Relevant To Coal Mining Safety And Health	74
Environmental Laws, Regulations, and Policies	78
National Legislation and Policies	78
Special Legislation and Policies Targeting the Coal Industry.....	79
Major Documents Concerning Closing And Bankrupting Of State-Owned Enterprises	79
Regulations And Documents Concerning Small Mine Closures.....	81
Reporting And Approval Procedures For Share Issuing In China	83
Reporting of Share Issuing	83
Approval Procedures for Share Issuing.....	84

Review and Approval Conditions for Share Issuing.....	85
Taxes and Exemptions Applicable to Foreign Investors.....	86
Other Tax Incentives.....	86
Annex2 : Current Coal Sector Administrative Practice.....	89
Duties of Provincial Land and Resources Bureaus.....	89
Shanxi	89
Shandong.....	89
Principal Duties of Coal industry Management Bureaus.....	90
Shanxi	90
Shandong.....	91
Approval Procedures in Shandong—Exploration Rights	92
Transfer of exploration rights	93
Defining Extent of Mining Area	93
Defining Extent of Mining Area	94
Examination and Approval of Mining Registration	95
Examination and Approval of Transfer of Mining Rights.....	96
Conditions for Obtaining a Coal production License.....	97
Coal Mine Acceptance Standards	98
Measures to Improve mine Safety Introduced by Shanxi Provincial Government	99
Annex 3 : International Comparisons.....	101
Coal Mining Sector Administration	101
United States.....	101
Australia	103
United Kingdom.....	104
Administration of Coal Resources	106
United States.....	106
Australia	107
United Kingdom.....	108
Approval Procedures for Coal Mine Exploration and Development	108

United States.....	108
Australia	111
Administration of Mining Health and Safety	114
United States.....	114
Australia	116
United Kingdom.....	120
Environmental Management.....	123
United States.....	123
Australia	125
United Kingdom.....	129
Japan	130
Coal Mine Closures and Policies	131
Coal Mine Closures and Policy Measures in Japan.....	131
Coal Mine Closures and Policy Measures in the United Kingdom ...	135
Fiscal Regimes.....	137
Tax Regime in the United States	137
Tax Regime in Australia.....	138
Policies to Promote Domestic and Foreign investment	139
United States.....	139
Australia	140
Coal Sales and Transportation	143
Coal Transport in Australia	143
Comparative Table Problems and Recommendations	147
Annex 4 : Case Studies.....	153
Qingxu County, Shanxi, Coal Mining Administration	153
Introduction	153
Xintai City, Shandong, Coal Mining Administration.....	155
Introduction	155
Coal Industry Bureau	156
Dongqu Mine, Shanxi, Environmental Impact and Reclamation	157

Feicheng Mining Area, Shandong, Environmental Impact and Reclamation	157
Tianchi Mine, Shanxi, Consolidation and Transformation	158
Introduction	158
Coal Sector Administration Procedures	159
Management and Personnel.....	160
Coal Mining Technology and Coal Preparation.....	161
Health and Safety	163
Environment.....	166
Economic and Social Aspects	170
Shungliu Mine, Shanxi, Consolidation and Transformation	174
Introduction	174
Coal Sector Administration Procedures	175
Management and Personnel.....	175
Coal Mining and Coal Preparation.....	176
Health and Safety	177
Economic and Social Aspects	181
Annex 5 : Workshops	185
Proceedings Coal Sector Administration & Investment Workshop. Beijing, August 26, 2003.....	185
Welcome and Opening Comments.....	185
Presentations	187
Assessment of the Existing Institutional and Regulatory Framework.....	187
Experience of the Existing Institutional Framework Based on a Review of Current Practice in Shanxi and Shandong Provinces[[b]]	188
International Comparisons.....	188
Conclusions and Recommendations	189
Presentations by Mining Companies	191
Discussion by The Coal Industry.....	191

A Proposal for Two Case Studies.....	193
Workshop Summary and Concluding Comments	193
Attachment 1: Workshop Program	195
Attachment 2: List of Participants	196
Proceedings	198
Workshop sponsored by the National Development and Reform Commission and the World Bank	198
Presentation of Study Results	200
Key Challenges for China's Coal Sector	200
Outline of the ESMAP Case Studies on Tianchi Mine and Shuangliu Mine	201
ESMAP Case Studies: Issues, Conclusions, Recommendations.....	202
Discussions on the World Bank Studies.....	203
Reform Initiatives	204
Development Strategy of the Coal Industry in China	204
Problems on Coal Enterprise Reform and Reorganization.....	205
Regulation and Normalization of Management of Coal Resources and Protection and Rational Utilization of Coal Resources ..	205
Status of Mine Safety and Countermeasures and Recommendations	206
Clean Coal Technologies and Air Pollution Control in China.....	207
Panel Discussion	207
Concluding Comments.....	210
Attachment 1 : Workshop Program	213
Attachment 2: List of Participants	214
Annex 6 : Selected Historical Data on China's Coal Sector	219
Annex 7 : Bibliography.....	225
List of Tables	
Table 1.1. Government Assistance to State-Owned Coal Enterprises in 2001 ..	14
Table 2.1 Fatalities from Coal Mine Accidents in China	18

Table 2.2. Benefits of Modern Industrial-Scale Mining Compared with Small-Scale Mining.....28

Table 4.1. Coal Production and Exports for China, Australia and the United States, 200249

Table A1.1. Classification of Mineral Resources and Reserves.....68

List of Figures

Figure 1.1. Procedures for Review and Approval of Coal Mine Projects (generalized).....9

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Abbreviations and Acronyms

AACI	Asian American Coal Inc.
AEMR	Annual environmental management report (Australia)
AML	Abandoned mine land (U.S.)
BCC	British Coal Corporation
BCE	British Coal Enterprise
BLBA	Black Lung Benefits Act (U.S.)
BLM	Bureau of Land Management (U.S.)
CA	Coal Authority (U.K.)
CBM	Coalbed methane
CCII	China Coal Information Institute
CMM	Coal mine methane
CSRC	China Securities Regulatory Commission
DMR	Department of Mineral Resources (NSW, Australia)
DOE	Department of Energy (U.S.)
DTI	Department of Trade and Industry (U.K.)
EA	Environmental analysis
EIA	Environmental impact assessment
EIS	Environmental impact statement
EMP	Environmental management plan
EPA	Environmental Protection Agency (U.S.)
EPB	Environmental Protection Bureau (China)
ETC	Economic Trade Commission (China)
FIRB	Foreign Investment Review Board (Australia)
GoC	Government of China
HSC	Health and Safety Commission (U.K.)
HSE	Health and Safety Executive (U.K.)
JACCS	Job and Career Change Scheme (U.K.)
JV	Joint venture
KSOCM	Key state-owned coal mines (China)
LBL	Load based licensing (Australia)
LMU	Logical mining unit
LTCC	Longwall top coal caving
MASHAM	Management and Administration of Safety and Health at

	Mines (U.K.)
MOFCOM	Ministry of Commerce (China)
MOFTEC	Ministry of Foreign Trade and Economic Relations (China)
MOH	Ministry of Health (China)
MOLAR	Ministry of Land and Resources (China)
MOP	Mining operations plan (Australia)
MPA	Mineral Planning Authority (U.K.)
MRI	Mitsubishi Research Institute
MSHA	Mine Safety Health Administration (U.S.)
Mt	Megatons (million [metric] tons)
Mtpa	Million (metric) tons per annum
NDRC	National Development and Reform Commission (China)
NEDO	New Energy and Industrial Technology Development Organization (Japan)
NRCS	Natural Resources Conservation Service (U.S.)
NSW	State of New South Wales (Australia)
OH&S Act	Occupational Health and Safety Act (Australia)
OSHA	Occupational Safety and Health Administration (U.S.)
OSM	Office of Surface Mining (U.S.)
QR	Queensland Rail (Australia)
RAMP	Rural Abandoned Mine Program (U.S.)
RHQ	Regional Headquarters (Australia)
SASAC	State-Owned Assets Supervision and Administrative Commission (China)
SACMS	State Administration of Coal Mine Safety (China)
SAWS	State Administration of Work Safety (China)
SDPC	State Development and Planning Commission (China)
SEPA	State Environmental Protection Administration (China)
SETC	State Economic and Trade Commission (China)
SOCM	State-owned coal mine (China)
SSB	State Statistical Bureau (China)
tpa	(metric) tons per annum
TVCM	Township and village coal mine (China)
TVIE	Town and village industrial enterprise (China)
UNDP	United Nations Development Programme
USDA	U.S. Department of Agriculture

VAT Value-added tax
WTO World Trade Organization
Yuan Units of Chinese currency, US\$1 = 8.28 Yuan as of 02/03

Foreword

1. China depends critically on coal to supply more electricity for better living conditions and a growing economy. While China's coal sector is now the world's largest, it is demonstrably also the most dangerous and most polluting. Reform for sustainable development of the coal sector lags behind China's accelerating economic reforms and the restructuring of its power sector. These were compelling reasons for ESMAP to support the activity "Capacity Building for National and Provincial Socially and Environmentally Sustainable Management of Coal Resources in China." The coal sector institutional and regulatory framework was examined at central, provincial, and local levels culminating in case studies at two mine sites. The studies were undertaken mainly by domestic experts with guidance from international specialists. Two workshops were held at which the findings were discussed with key government officials of Chinese agencies.

2. The goals of this ESMAP activity include the development of safe and healthy coal mines in China, reduced environmental impact of coal mining, cleaner coal for small consumers, improved access to coal reserves by private investors, and a level playing field for mine operators, including security of tenure and freedom to exploit reserves in the most economic manner. Appropriate government policies are key to introducing and implementing changes required for achievement of these goals. This report suggests possible policy solutions and identifies capacity-building needs.

3. Project timing coincided with reforms by the government of China (GoC) in spring 2003 that addressed some of the state coal mining sector administrative issues but not the many problems at lower levels. The report therefore remains valid in that it highlights key issues that were not addressed at the state level in addition to those still needed at provincial and lower levels.

4. The report is aimed at informing the GoC, international governments, donor agencies, investors, industry, and the public of the current status of the coal mining sector in China and the further reform that is needed to ensure environmental and economic sustainability.

5. Given the scope of the present ESMAP activity and the quality of the contributions, a basis has been created for a dialogue with the GoC on priority actions to address the most pressing issues facing the country's coal industry, moving the industry forward in a way that is both economically viable and environmentally sustainable and that could attract support from both the donor community and investors alike.

Executive Summary

1. China's rising energy demand and its critical dependence on coal calls for a fundamental "rethinking" of its approach to the sector to both sustain the existing production base and mobilize significant investments in additional capacity. This need, however, has to be seen in the context of a large existing sector characterized by many obsolete mines and detrimental environmental impact. To meet the challenges, changes are needed to improve mine safety and health, protect the environment, provide cleaner coal for small consumers, open the access to coal reserves by private investors, create a level playing field for mine operators, secure tenure of ownership rights, and guarantee the freedom to exploit reserves in the most economic manner. Only with such changes can China secure the investments needed to replace obsolete production capacity and meet future demand. This report recommends policy options, identifies capacity-building needs, and highlights key issues not addressed in recent reforms at the state level.

Institutional framework

2. There are four levels of administration in China's coal sector: state, province, prefecture, and county. State agencies are responsible for planning of the national coal industry, implementing key laws and regulations, promoting sound safety and health practices, and ensuring adequate coal supplies. The state also approves large coal projects. Provincial agencies prepare provincial-level strategic plans for the industry, implement state laws and regulations, and issue mining rights for medium-sized mines. At the prefecture and county levels, the main activities are implementation of state laws and regulations. Prefectures also review and issue mining licenses for small mines.

3. There are three main groups of mines in China: key state-owned coal mines (KSOCMs), state-owned coal mines (SOCMs), and township and village coal mines (TVCMs). Most medium and large coal mines are state-owned, and smaller mines are collectively owned at the township level, with small private companies accounting for an insignificant share. Government policy is to close depleted and uneconomic coal mines and to encourage aggregation into large coal mining groups. Most of the 94 state-owned coal enterprises have been transformed to limited liability companies, with some 10 companies listed on domestic and foreign stock exchanges. Four state-owned companies hold a monopoly on coal export licenses.

4. The Mineral Resource Law (revised in 1996) and numerous recent regulations have made important changes in the management of coal resources. China plans to move to a system of tendering and auctioning of all mining rights. Before a new mining project can start, various governmental departments must approve several documents, of which the project concept establishment proposal is the most important. It is used by the government to monitor supply. Approvals must be referred to the National Development and Reform Commission (NDRC) for mining projects of >2.0 million tons

per annum (Mtpa) production capacity for a mining area and >0.6 Mtpa for an individual mine. There are also minimum capacities for new mines that vary in different provinces.

Key Issues

Safety and Health

5. Accident rates remain exceptionally high, only partly due to the very high rates in small coal mines. The risk of a fatal accident in a small mine is 10 times higher than in a large state-owned mine but the latter still have accident rates far above those in developed coal mining countries. Insufficient training, lack of modern mining equipment and practices, low miners' wages, and insufficient protection of miners' rights contribute to lower standards in mine safety and health. The powers of mine inspectors are too weak and there are too few for the large number of mines. Safety management at KSOCMs relies on punishment and rewards. While these methods are effective, the zero fatality targets of international mining companies will not be achieved or even approached without revising safety legislation to allow a less prescriptive and more preventive approach. Coal mining health statistics are compiled by the Ministry of Health (MOH) but health protection measures are the responsibility of the State Administration of Coal Mine Safety (SACMS). Health issues receive even less attention than safety in coal mines. No health data are available from small mines.

Environmental Protection

6. Despite numerous laws and regulations the present system is weak. The problems include failure to enforce environmental legislation, ineffective ties between coal production and environmental protection responsibility, inadequate laws and regulations, and inability of financially strapped coal companies to commit sufficient funds for reclamation. Environmental impact assessments (EIAs) are required for new mine projects but these are aimed at getting a mining license rather than to achieve high environmental standards once the mine is developed. Provisions for reclamation are widely ignored. Supply and use of dirty coal is a serious unattended issue that impacts urban air quality and public health.

Restructuring and Rationalization

7. Small mines are commonly operated under substandard safety and environmental conditions. They also distort markets and waste reserves through low recovery and intrusion into the mining areas of larger companies. Since the late-1990s, the state has carried out an aggressive program to close large numbers of mostly small illegal mines. However, there is evidence that many mines have reopened and that illegal mine production may be significantly understated. Local government officials are often reluctant to close or report illegal local mining activities because of direct financial interests or local pressure not to close income-generating mines. However, a desire by local governments to stabilize coal prices is a driver for the closure of small mines after new large mines have been constructed. The replacement of all of China's TVCMs by larger mines would significantly improve the economic and social impact on local

communities but mitigation of the social and environmental impacts of small mine closure has yet to be assessed and made a priority by the government.

Supply Shortages

8. Future energy needs will demand a continued high level of domestic coal supplies, while environmental and social concerns require a reduction of small-scale mine operations. Increased output from that subsector, as practiced in the past, is no longer an option. The speed and effectiveness of replacing small mines by large mining capacity will depend on the ability of the large, state-owned mining groups to finance them, which will require an investment of some US\$11 to US\$18 billion. Capital from the commercial financial markets and private investors will be required, but will not be forthcoming unless sector reforms are accelerated and the investment climate is improved.

Investment in Coal Mining

9. “Command economy” mentality, policies, and administration still hamper the establishment of an equitable market environment and the attraction of large-scale private investment. In more than two decades of open-door policies, only two coal mines have been developed by foreign investors. Interviews with potential major foreign investors identified the following concerns as key barriers:

- **Inadequate laws.** While most companies believe that acceptable joint venture arrangements can be negotiated, all are concerned about the level of protection they will receive under Chinese law, in particular with regard to the security of title to coal resources.
- **Inadequate enforcement.** Companies believe that weaknesses in enforcement are detrimental to establishing a level playing field. Failure to uniformly enforce health and safety as well as environmental standards that foreign mining companies will meet, results in lower-cost production from noncompliant mines. Illegal mining into underground coal reserves held by legal companies reduces the reserves available for modern mining operations and increases the risks from inrushes of gas and water.
- **Inadequate availability of reserves.** Most foreign investors report problems in finding available high-quality reserves near transport infrastructure. The best reserves are either held by selected large Chinese companies or are too remote to be economic.

Although contrary to official guidance, foreign companies have been discouraged by provincial governments from participation in exploration for new resources.

- **Transport and export issues.** The present system of concentrated control of both rail infrastructure and export authority, coupled with high transport costs, means foreign investors are unable to

supply coal at competitive prices to distant markets. Investors' flexibility to respond to changing market conditions is restricted, and there is potential for unequal treatment in the allocation of rail transport capacity and export rights.

International Comparison

10. China's coal mining practices and efficiency compare poorly with global competitors. The four countries reviewed were Australia, Japan, the United Kingdom, and the United States. Australia and the United States have large coal reserves and an expanding coal sector, while both Japan and the United Kingdom have depleted most of their coal reserves and closed most mines. The following elements of each country's policies, legislation, and enforcement appear to be of particular relevance to China.

Australia

11. The country has been highly successful in attracting domestic and foreign investment into its coal sector, with more foreign investment each year than the cumulative private foreign investment in China's coal sector over the past two decades. The key factors behind Australia's success are rich coal resources, political stability, and policies and legislation attractive to investors. The federal government is responsible for ensuring that foreign investments are not detrimental to Australia's national interests. Investment proposals by major foreign companies are rarely rejected. Ownership and management of coal is at the state level (corresponding to the provincial level in China). The state of New South Wales operates a representative, effective leasing system characterized by reasonable royalties, secure tenure of ownership rights, free entrepreneurial decisions, and supportive public geological services.

United States

12. The United States follows a dual system with both privately owned coal rights (mostly in eastern states), and federal government-owned coal (on extensive federal lands in western states). The federal government leases coal through a competitive bidding system, whereby acceptable bids must meet or exceed the government estimate of "fair market value." Leases have an initial term of 20 years but may be terminated in 10 years if the company fails to produce commercial quantities of coal. All companies must provide bonds to ensure compliance with lease conditions, and reclamation of all mined areas is mandatory. Both at the federal and state levels, the role of government is heavily oriented toward strict enforcement of mine health and safety and environmental regulations. Private investors make all coal investment, production, sales and transport, and export decisions. Laws and heavy penalties protect consumers from collusion and price fixing among coal producers.

Japan and the United Kingdom

13. Both countries have undertaken major coal mine closure programs to rationalize ailing industries. These include measures to mitigate social and economic impacts and provisions for the management of environmental liabilities arising from mine

closures. Japan did not discriminate between small and large mines in supporting mine closures. Mine owners received compensation for their loss of rights when mines were acquired by the government. Both in Japan and the United Kingdom, coalfield area regeneration was implemented by government. Various schemes seeded development of new businesses and retrained miners.

Conclusions and Recommendations

14. The GoC has already taken several commendable actions, such as closing redundant and damaging mines, reducing overlap of administrative responsibilities of agencies at the state level, and introducing a bidding system for coal leases. However, to reap the full benefits of overall improvements in the sector and increased investments, laws and regulations must be consistently enforced, the sector rationalized, and its investment climate improved. In particular, the following additional regulatory and institutional changes are recommended for key areas of concern

- **Safety and health.** Safety inspection and enforcement departments should be further strengthened and inspectors given authority to impose substantial fines and immediately terminate operations at any mine where there is imminent risk to worker safety. Preventive safety policies and practices that enable mining companies to achieve above-average safety performances should be institutionalized for all mines. A formal link should be established between the MOH and SACMS to ensure occupational health data are gathered from all mines and used to monitor and improve the effectiveness of protection measures.
- **Environment.** Local officials and mine management should be held accountable for environmental management failures. The capacity and resources of local environmental protection bureaus (EPBs) should be strengthened to ensure enforcement. All mines should be required to post sufficient bonds to reclaim mining areas. The magnitude of environmental liabilities that could arise from small mine closures should be researched to enable formulation of suitable policy. Regulations should be imposed and enforced on the coal supply side to prevent low-quality coal from being used, especially for domestic purposes. Incentives are needed to encourage use of cleaner coal by all consumers.
- **Sector restructuring and rationalization.** To help meet China's energy needs in an environmentally and socially acceptable way, small-scale mining should be consolidated and transformed into large-scale mining with improved impact on regional development. Strict field monitoring should ensure that closed mines do not reopen. The ability and effectiveness of local governments should be strengthened to plan for small mine closure, economic

diversification, and social mitigation. Funds should be made available by central and provincial governments for supervision of small mine closures, postclosure policing, site rehabilitation, mitigation of social problems, promotion of economic opportunities, and compensation for mine owners.

- **Availability of coal reserves.** An annual “holding fee” should be established, sufficiently high to discourage speculative holding of coal resources. The mining license period should be reduced to 25 years, automatically renewable when all terms and conditions of mining and reclamation have been met. The government should retain the option to issue licenses based on exploration expenditure commitments for areas where the coal potential is largely unknown and there is no investor interest for auction. A review should be conducted, with government and industry, of geological data as well as coal exploration and mining rights deficiencies with the aim of increasing availability of information and stimulating active exploration.
- **Investment climate.** The provincial government’s licensing role should be strengthened and the production capacity criterion for referral of projects to state level removed. Provincial government intervention in the operation of the large state-owned mining groups should be reduced and mining enterprises allowed to manage their business in accordance with commercial criteria. All coal companies should be treated equally. Mine design and equipment regulations should be revised and aligned with current international mining practice and standards.

15. The recommended changes could become core components of a two-pronged government strategy that would attract new investment and at the same time reduce obsolete and environmentally/socially unacceptable mining capacity.

1

Review of The Institutional And Regulatory Framework

1.1 The Coal meets some two-thirds of China's energy needs, with China being both the world's largest consumer and largest producer. It accounts for one-third of the world's total coal production. China is a net exporter, with coal exports rising dramatically from 32 million tons (or megatons tons [Mt]) in 1998 to nearly 85 Mt in 2001. Expansion of exports was checked in 2003 following coal supply shortages to power plants. China's coal production was over 1.1 billion tons in 2001, rising to 1.7 billion tons in 2003.

1.2 The coal mines of China are officially classified into three groups: KSOCMs, supervised by the provincial governments since 1998; SOCMs; and TVCMs, including private mines. There are many small private coal mine companies, typically with a production capacity of less than 20,000 tons per annum (tpa), mainly supervised by county governments. In 2003, about half the coal production came from the large industrial-scale KSOCMs and a third from the small TVCMs.

1.3 The structure of the GoC has been described as a "matrix muddle" of vertical and horizontal lines of authority and reporting.¹ Three main vertical lines may be identified. The first comprises the core of China's government. At the top is the State Council, which resembles a ministerial cabinet, and is nominally subordinated to the National People's Congress or legislature. The State Council is underpinned by the NDRC, which undertakes strategic and economic planning. The People's Congress and NDRC planning functions are then replicated at all three lower levels of government: province, prefecture, and county. Cross-sector tasks such as the regulation of work safety, occupational health monitoring, land use, environmental protection, business licensing, bankruptcy, and transport involve additional agencies. At any level of local government, an industrial enterprise is subject to instructions from three types of agencies: the local government itself, the local relevant industrial bureau, and the local specialized bureaus. With the central government transferring powers to the lower level, the People's Congress of the

¹ Lieberthal, K. 1995. *Governing China. From Revolution through Reform*. New York: W.W. Norton. Andrews-Speed, P., M. Yang, L. Shen, and S. Cao. 2002. "The Regulation of China's Township and Village Coal Mines: A Study of Complexity and Ineffectiveness." *Journal of Cleaner Production*. Elsevier Science Ltd.

provinces and local governments are gaining greater legislative powers. Local laws and regulations on coal generally relate to the exploitation and use of reserves.

1.4 The coal sector administration has been undergoing major reforms since the late 1990s. Prior to 1998, the central administration of the coal sector was performed by the State Development and Planning Commission (SDPC), the State Economic and Trade Commission (SETC), the Ministry of Geology and Mineral Resources, and the Ministry of Coal Industry. In 1998, the Ministry of Coal Industry was abolished and the State Administration of Coal Industry was formed under SETC. Operational management of the coal mining enterprises was transferred to the provincial governments. The Ministry of Geology and Mineral Resources was abolished and replaced by the Ministry of Land and Resources (MOLAR). The State Environmental Protection Administration (SEPA) was elevated to ministerial status. Most provinces, prefectures, and counties abolished their coal industry bureaus, and their duties were partly transferred to the Economic and Trade Commission. However, in a few large coal-producing provinces, such as Shanxi Province, coal industry bureaus were retained. In January 2001, the State Administration of Coal Industry was abolished and its duties reassigned to various departments of SETC. In the second half of 2001, the central government separated the coal mine safety supervision bureau and coal industry management bureau in the coal-producing provinces. The State Administration of Work Safety was established and integrated with the State Administration of Coal Mine Safety. Thus, mining operational responsibility was sensibly separated from safety inspection and enforcement. In March 2003, the SETC and the Ministry of Foreign Trade and Economic Relations (MOFTEC) were abolished and replaced by a Ministry of Commerce (MOFCOM). The SDPC was transformed to the NDRC with a reduced emphasis on planning activities and greater attention to policy research and strategic matters. An Energy Bureau was established within the NDRC, responsible for the strategic overview of national energy supply and production, including coal. A state-owned Assets Supervision and Administrative Commission (SASAC) was formed to take responsibility for the management and disposal of state-owned assets. These reforms are expected to further reduce government intervention in China's market economy and free up commerce as required upon China's accession to the World Trade Organization (WTO).

1.5 However, despite these significant institutional changes the relationships between the central government and industry administration departments remained virtually unchanged. Further reforms are needed. The GoC is seeking to identify and implement reforms that will, over time, lead to a significantly restructured coal sector, with higher productivity, improved social conditions, enhanced health and safety standards, mitigation of historic environmental degradation, and achievement of high environmental standards for existing and future mining activities. This report describes the organizations, duties, and functions of coal-related departments under the State Council, analyzes the characteristics and shortfalls of China's coal administration system, and compares various aspects with Australia, the United States, United Kingdom, and Japan. The report examines the key issues facing the coal mining sector and recommends policy actions and capacity-building needs that would assist the government to achieve its aim of an economically sustainable coal mining industry.

Administrative Organization of the Coal Mining Sector

1.6 Administration of coal production is achieved through a chain of licensing procedures that involves reviewing a range of criteria from technical aspects of the mine's design, safety facilities, and staff competency to the macro supply and demand balance to prevent oversupply conditions. Administration offices at provincial, prefecture, and county levels are responsible for activities within their respective jurisdiction but are required to pass documents to a higher level for review and approval:

State-Level Administration

- **NDRC** is mainly responsible for the strategic planning of coal industry development, review and approval of plans for the construction of large and middle size coal mines, and for coal pricing policies. All mining (and other construction) projects must be reviewed by the NDRC. Large coal mining projects are referred to the Energy Bureau coal division for review and approval.
- **MOLAR** is responsible for the administration of mineral resources, which are owned by the State, in accordance with the Mineral Resources Law and additional regulations. Its duties including review and approval of reserves; exploration, mining, and land-use rights; issuing exploration and mining licenses; review and approval of the transfer of exploration, mining, and land-use rights; and lease arrangements for coal mine construction. Issues related to the determination and classification of coal reserves are summarized in annex 1. The procedures implemented by MOLAR for acquiring, registering, and transferring exploration and mining rights are summarized in annex 1 and examples provided in annex 2.
- **The State Administration of Work Safety (SAWS)**, and its alter ego **SACMS**, are responsible for safety inspections of mines, accident investigations, and enforcement of mine safety legislation at the central level and through its 20 provincial coal mine safety supervision bureaus and 71 coal mine safety supervision offices. The current laws and regulations with regard to coal mine safety and health protection are summarized in annex 1.
- **SEPA** is responsible for developing national environmental policies and for assisting in the drafting of environmental laws, regulations, and standards. Many of these are general to all industrial activity and others are specific to coal mining (relevant regulations are set out in annex 1). SEPA oversees the operations of EPBs at provincial and lower levels, as well as of a hierarchy of environmental monitoring stations. Provincial EPBs draw up local regulations and are responsible for enforcing and monitoring compliance with all relevant laws and regulations at lower levels of

government. They are also responsible for reviewing and approving EIAs for mining projects.

- **SASAC**, directly under the State Council, is responsible for administration of the assets of all state-owned enterprises. The role of SASAC is to oversee shareholding systems, select and appoint able senior executives, inspect operations, and seek to improve asset value. Inspectors will monitor the state-owned enterprises but must not directly interfere with business management. More than half of the provinces and cities of China have established local SASACs. In the past five years, the transaction volume of enterprise mergers and acquisitions in China has increased at the rate of 70 percent per year.
- **MOFCOM** subsumes the State Industry and Commerce Administration and also is responsible for some of the tasks of the former State Economic and Trade Commission, which was abolished in 2003. Sino-foreign joint venture projects in excess of US\$30 million require MOFCOM approval. Foreign investment greater than US\$100 million will involve NDRC and MOLAR in submitting reviews of the proposals to State Council for approval with MOFCOM responsible for the business license. The Ministry's State Industry and Commerce Administration is responsible for the approval, issuing, and annual examination of domestic coal enterprise business licenses.
- **The China National Leadership Group for Enterprise Merger, Bankrupting and Staff Re-employment** is responsible for organizing the joint review of coal enterprise closures and bankrupting by the Ministry of Commerce, Ministry of Finance, People's Bank of China, and the Ministry of Labor and Social Security. The group combines the expertise of a number of departments from different governmental organizations. It also reports the comments of the joint review to the State Council, and issues the document on closing and bankrupting after approval by the State Council.
- **The Ministry of Railways** is responsible for the coordination of coal transport by rail. Coal transport accounts for more than 40 percent of the total railway freight transport in China. The government is expanding the rail network and seeking to introduce more competition to boost the efficiency of the transport system by separating train services from track management. Rail transport costs for minerals can be substantial, and the feasibility of a project may hinge on the distance to a market.
- **The Ministry of Communications** coordinates coal transport by highway, waterway, and port shipment.

Provincial and Local Government-Level Administration

1.7 Provincial government is responsible for administration of the KSOCMs, provincial-level strategic planning for the coal industry, implementing state laws and regulations, and the review and issuing of mining licenses (mining rights) for medium-sized mines. At the prefecture and county levels the main activities are the implementation of laws and regulations from state agencies. Prefectures also review and issue mining licenses for small mines.

1.8 Economic trade commission (ETC) departments in some provinces, and coal industry management bureaus in the major coal mining provinces are responsible for: local implementation of industry policy; coal industry planning; reviewing, approving, issuing, and checking coal production (operating) licenses; issuing and checking mine directors' certification, and the closing and bankrupting of state-owned coal mining enterprises. They also have coal mine safety responsibilities.

Assessment of the Current Coal Sector Administrative System

1.9 Reforms at the state level have not been followed through at provincial and lower levels. For example, ETC functions continue but without central leadership because of the abolition of the SETC. Integration and rationalization of coal sector administrative departments is urgently needed as the coal sector administration system is still too cumbersome due to the number of agencies and ministries involved and the replication of functions at the four administrative levels. Contradictory regulations and policy, overlap of functions, and imperfect procedures are evident

1.10 The regulatory framework is incomplete and needs overhaul. Past ministries have introduced laws, some of which are now irrelevant or contradictory to more recent legislation. Laws and regulations relating to small mines are patchy and incomplete; consequently, the administrative system is weak. The government has developed a number of measures relating specifically to TVCMs, but these have tended to focus on particular concerns such as mine design and safety. Issues such as access to mineral rights, land management, water pollution, soil conservation, and land reclamation are either omitted entirely or are addressed in a cursory way.

1.11 Contradictions and inconsistencies exist among policies and regulations drafted by coal-related governmental departments. For example, in 1988 the Ministry of Finance issued the No.18 document "Notice on Doing Well with the Management of Tax Collection for Occupied Arable Land," which stipulates that after the arable land occupation tax is collected by central government, the locally collected land reclamation fee should stop immediately. However, provincial land reclamation regulations in both Hebei and Shanxi stipulate that arable land destroyed by coal mining should be occupied and land reclamation fees and arable land construction funds should be paid (0.2-1.0 Yuan/ton in Hebei Province and 0.4-0.6 Yuan/ton in Shanxi Province). There are also inconsistencies with regard to interpretation of government policies for encouragement of foreign investment in coal exploration and mining ("Industries Guidance Catalogue for Foreign Investment" and "Guide to Investment in China's Mining Industry"). Some

authorities use the guidance as a restrictive instrument, which is contrary to the intention of central government.

1.12 The EPBs, land and resources departments, and coal industry bureaus have overlapping environmental protection responsibilities in the coal mining sector. The EPB generally focuses on water and air pollution, whereas the land and resources department is explicitly responsible for land reclamation. The EPBs set environmental standards but rely on coal administration and mining enterprises for day-to-day administration of environmental matters and do not carry out inspections to check for compliance. In addition to their duties to prevent illegal coal production and sales, coal industry bureaus monitor illegal mining beyond lease boundaries on behalf of land and resources departments that have too few resources to police this problem. They also undertake supervisory tasks that should be the direct responsibility of coal mining enterprises. Coal industry bureaus are also required to approve the final construction of a mine ostensibly for safety reasons, even though the design has been approved by the development and reform commission and the mine will also be inspected by the coal mine safety department as a matter of routine. Much of the overlap, and unnecessary bureaucracy, would be removed by strengthening the capacity of EPBs and limiting the activities of coal industry bureaus to coal production licensing.

1.13 In addition to inconsistency and overlap there are other imperfections of the coal sector administration. In pursuing a coal mining project, an investor needs to submit separate applications to NDRC, MOLAR, and other organizations resulting in delays and considerable uncertainty in timing and outcome. Even where the requirements for individual procedures may be clear, there is uncertainty as to whether all necessary procedures have been identified and completed. The existing administration system focuses heavily on assisting the KSOCMs. The coal sector administration system has not effectively addressed the socioeconomic problems arising from extensive small mine closures. In contrast, detailed and costly provisions have been made to address the social impacts of closure of state-owned mines. On the basis of field study results (annex 4), domestic experts consider staff numbers in the coal administration departments and organizations at the various local levels to be consistent with the GoC policy to simplify the administrative structure and improve efficiency. However, budget appropriations are insufficient to support the staff and workload requirements of most departments. Reduced government intervention in coal production and sales, and removal of overlapping functions, would reduce workloads and hence staffing requirements.

Approval Procedures for Coal Mine Development

Acquisition and Transfer of Exploration and Mining Rights

1.14 The procedural steps and documentation required for the acquisition and transfer of exploration and mining rights are set out in annex 1. New regulations, which are now being introduced by provincial governments, require compensation for acquiring coal exploration and mining rights. The transfer fee will consist of a mining right fee and also a mining royalty determined by the state. The latest mine royalty standard stipulated by the state is 1,000 Yuan per square kilometer annually. The mining right fee or “coal reserve price” will be evaluated by independent exploration and mining evaluation

agencies on the basis of coal mining conditions, coal quality, and transport situation and is expected to be in the range of 0.5 to 1.0 Yuan/ton.

1.15 MOLAR is considering offering exploration licenses for new areas, where interest may be limited, on a first-come, first-served basis. The detail of how this is to be done has yet to be determined. A well-defined process is needed to avoid investment uncertainty and lack of transparency.

1.16 MOLAR is considering offering exploration licenses for new areas, where interest may be limited, on a first-come, first-served basis. The detail of how this is to be done has yet to be determined. A well-defined process is needed to avoid investment uncertainty and lack of transparency.

1.17 The commitment by the GoC to cease awarding mineral rights by administrative approval and introduce a market-based bidding system in its place, is a positive move toward better management of China's coal resources. However, there are indications that the large State-owned coal mining enterprises will receive preferential treatment. In spring 2004, MOLAR announced that stricter controls will be imposed on coal resources to assist the development of large-scale coal mining enterprises. No new coal mining rights would be issued until the new plans were completed. This would tilt the playing field in favor of the state and could reduce the availability of choice coal prospects for foreign investors. On the positive side, there will also be a check on the legality of existing mining rights, which should help to clarify uncertainties regarding mining titles.

Approval of Land Use for Coal Mine Construction

1.18 Land use for mine construction must conform to the local development plan and shall be approved by the relevant land and resources department. Land-use rights are compensated by two kinds of payment:

- a land acquisition fee set by the government as a single payment to the former land user; and
- an annual fee payable to the local government.

1.19 The level of approval required for land use depends on the area occupied by the proposed project and the former land use:

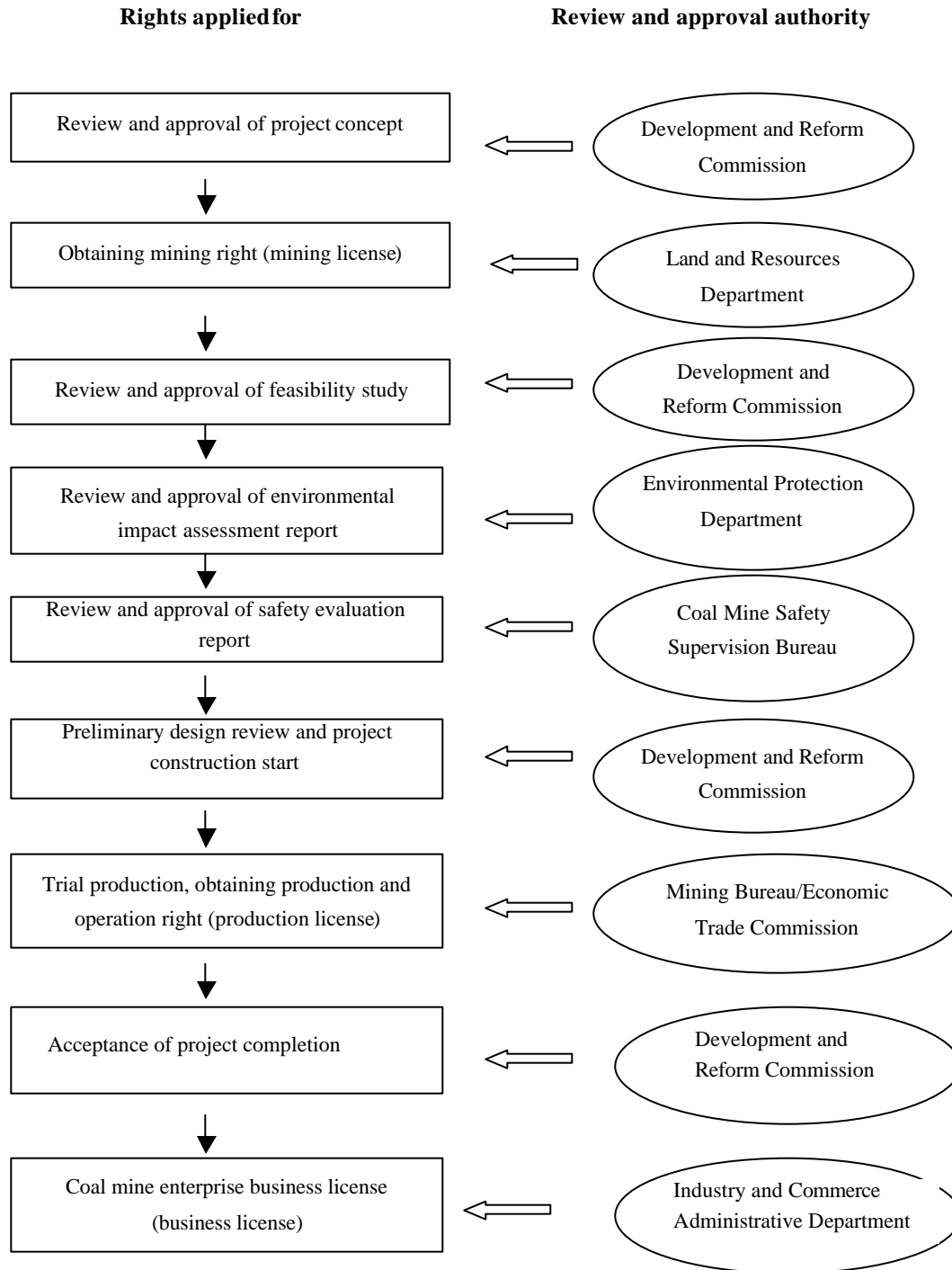
- Use of protected agricultural land requires review at the state level and State Council approval.
- Use of common arable land <35 hectares (1 hectare = 10,000 square meters) or other land <70 hectares should be approved at the provincial level.
- Use of common arable land >35 hectares or other land >70 hectares should be approved at the state level.

1.20 For large mine sites, especially opencast operations, the above procedures could result in considerable delay in gaining approval.

Approval of Coal Mine Construction

1.21 A series of review and approval procedures must be completed prior to initiating construction of a mining project (figure 1.1) or any other type of construction project. These procedures were originally intended for civil construction projects where the risks are easily quantified, and are not particularly suited to mining projects where the risks are higher and cannot be determined until a substantial amount of money has been spent.

Figure 1.1. Procedures for Review and Approval of Coal Mine Projects (generalized)



1.22 Approvals must be referred to the NDRC at state-level for medium and large mining projects, defined as >2.0 Mtpa for a mining area and >0.6 Mtpa for an individual mine. Most modern mines are of large capacity and thus must be referred to NDRC. Mining areas and mines with smaller capacities than these are approved at the provincial (autonomous region or municipality) development and reform commission level. The construction of low-capacity coal mines is discouraged by government, and minimum capacities for new mines have been specified. These range from 0.3 Mtpa in Shanxi to 0.06 Mtpa in western and central southern China, and 0.03 Mtpa where extra-thin seams or residual pillars are worked.

1.23 The project concept approval stage is considered the most important by NDRC as it enables the investment process to be initiated and provides the central government with a measure of future coal supply capacity to assist strategic planning. The need for review and approval of the feasibility study stage by the NDRC is expected to be eliminated in the future. Feasibility is recognized as a commercial issue that should be determined by the project developer. The review and approval of a coal mine construction project is mainly undertaken by a government planning department, and the formal details are prepared by a mine design institute on behalf of the enterprise. Specific technical and performance criteria must comply with mine design codes. Without these, a project is unlikely to obtain approval; mine design institutes are familiar with working to these standards. The project proposal should also be consistent with national economic and social policies.

1.24 Time limits for a decision from each government department on receipt of all relevant documents range from 30 to 60 days but these are not necessarily adhered to. NDRC at state-level will usually submit feasibility study documents to an engineering institute for review on its behalf. EIA reports are appraised by a panel of experts on behalf of the environmental protection department. A safety evaluation report is also now required to ensure proper consideration of safety issues in the mine design.

1.25 After acceptance by the government planning department, the project can enter the construction phase. Prior to being granted an operating license for a coal mine there is also a trial production stage in which the coal administration department must be satisfied that construction has been completed in accordance with the approvals. It is one more hurdle and cost that a new mine must pass before entering full operation. Further details of the documentary requirements are provided in annex 1.

Standards for Coal Mine Design

1.26 The current coal mine design standards are part of the state industry standards of China. They date from 1994 and are summarized in annex 1 (which also includes a design regulation issued in 1992 specifically aimed at small coal mines). Revision of the coal mine design standards is in progress but the new ones are still likely to be prescriptive rather than performance based.

1.27 The design standards are rigid, making no allowance for technological developments and site-specific project requirements. They are not compatible with modern coal mining standards and practices in industrialized countries and slow the

introduction of mine design and equipment innovations that increase productivity, reduce operating costs, and enhance mine health and safety. Adherence to prescriptive design standards also hinders innovation in competitive tendering.

1.28 The rules for coal mine design require a minimum life for a mine depending on the production capacity irrespective of the quality and workability of the reserves or the mining costs. A minimum recovery is also specified depending on seam thickness. Regulations specifying recovery percentages for coal seams are not used in modern mining practice in other countries, where recovery is determined by the mining company itself using financial criteria to maximize mine profitability within sound mining practices.

1.29 All imported mining equipment must be subject to an inspection and approval process before it can be used in a mine in China. Unless exempted, explosion-proof and intrinsically safe equipment cannot be used in a Chinese coal mine until awarded the MA (Mei Anquan) mark. Most coal mining countries have a similar stipulation although many have reciprocal agreements and work to common international safety standards. Test reports on both domestic and foreign electrical equipment are valid for five years. Renewal of the MA certification represents a significant delay and added costs, and is not consistent with WTO rules. Lack of parity between Chinese and international standards not only hinders import of mining equipment into China but also deters Chinese manufacturers from modernizing their designs and participating fully in international markets.

1.30 Favorable results are reported where exemptions have enabled modern mine designs and equipment to be introduced. For example, Shenhua and Jincheng Coal Mining Groups have successfully introduced U.S. and European state-of-the-art longwall equipment into their new mines. Shenhua Group subsequently achieved world record coal production rates at its Daliuta mine with this equipment. Foreign mining companies will not invest unless they receive approval for modern coal mine designs, equipment, and mining practices (the Asian American Coal joint venture [JV] to develop the Daning coal mine in Shanxi Province is a successful example). A major stated goal of the GoC in seeking foreign investment is to introduce modern equipment, mining techniques, and management practices to China, so the rationale for improving the present inflexible system is clear.

Supervision and Monitoring of Coal Mining Operations

Coal Production and Marketing Controls

1.31 The government authorizes, monitors, and regulates coal production, sales, and export activities through its licensing systems. Licenses are issued at the state level for trans-province and foreign enterprises and at the provincial level for other enterprises. Supervision tasks are performed at the state, province, prefecture, and county levels. Once a coal mine construction project meets the completion tests (is accepted), both the coal production license and coal sales rights can be applied for. Enterprises that fail to obtain the license are not allowed to produce.

1.32 Since the gradual deregulation of coal prices in 1993, the GoC has reduced its interference with enterprises' coal production. However, as a temporary measure during the period 1999 to 2002, action was taken to control oversupply of coal that resulted in very low coal prices and threatened the sustainability of the industry. The SETC set annual production quotas for coal-producing provinces, and then each province allocated the coal production target to prefectures, cities, and large coal enterprises. This process may have resulted in arbitrary closure of some large mines as a result of their location, rather than their competitiveness. The effect of reducing production at key mines was to increase the production costs, offsetting some of the benefits of a rising coal price. State-owned mines were required to simultaneously accept production caps and reduce operating costs, but were not permitted to reduce staffing other than through normal staff turnover. Such interventions disrupt the normal functioning of market forces and risk introducing inefficiencies and higher costs into the operation of coal enterprises.

1.33 An annual coal fair is organized by the NDRC to bring suppliers and consumers together to plan coal production, transport, and customer allocations. This is a remnant of the planned economy that attempts to fix coal output, transport logistics, and prices for the coming year to achieve a balance. A coal mine is required to sell to an assigned customer with no right to sell to others, thus stifling competition. The government is persisting with this annual process but it is becoming increasingly unsuccessful as mines prefer to sell their coal at market prices, which are consistently rising and outstripping approved contract prices.

1.34 Currently, only four companies are licensed to export coal from China: China Coal Import & Export Corp., Shanxi Coal Import & Export Corp., Shenhua Group Corp., and China Metals Import & Export Corp. Other coal enterprises and users can appoint one of the four companies to act as a coal export or import agent on their behalf. This system reduces competition in coal export markets and may lead to increased corruption and preferential treatment of coal companies. Deregulation of the present export license system is expected in the future.

Coal Mine Safety and Health Supervision

1.35 The safety supervision system involves an annual review in addition to regular routine inspections. Coal mine safety supervision departments are responsible for safety inspection and enforcement although there seems to be overlap at city and county levels with coal industry bureau (or ETC) functions. There are concerns as to the effectiveness of enforcement because SACMS mainly recruits its inspectors from the same local mining areas they are to supervise, and hence they may be partisan. The inspectors also face major logistical problems due to the number of mines that require inspection and the detailed attention needed at each site. As an example, the No.2 Safety Supervision Department, Shandong Province, is responsible for safety supervision of 346 coal mines, of which 93 are controlled by prefectures and counties and 253 are TVCMs. Ten staff oversee the safety supervision at these 346 coal mines. Based on information provided by four safety supervision offices, the No.2 Safety Supervision Department carries out key supervision on work sites for four days each week and spends one day reporting and planning work. KSOCMs receive attention from the key supervision group five times per year or less. The small mines with their poor safety record require regular investigation

(weekly) by independent safety inspectors but this is not practicable with current staff numbers.

1.36 New State Council regulations, implemented in mid-2003, empower mine inspectors to spot-fine individuals up to 50 Yuan and a mining company up to 1,000 Yuan, but they must refer to a higher authority to terminate unsafe mining operations. Ultimately, mine owners can be fined up to 150,000 Yuan and have their mines closed if they are found guilty of breaching the new safety regulations. Local government leaders will be held accountable if two or more mines are found to be operating illegally.

1.37 Training is an important part of the work of SACMS both for capacity building among safety inspectors and safety training for management and workers. A total of 21 national training centers have been established with 8 specifically focusing on mine safety. SACMS recognizes there is much to be learned from the international community, and the centers are encouraged to establish international collaborative links. There are also approved safety training centers at the local level. KSOCMs train mineworkers at local mine-based centers; new workers are required to attend a training course and pass an examination before commencing work. Small mines do not have the resources, knowledge, or motivation to engage in training and training-support schemes.

1.38 The MOH is responsible for occupational health monitoring of mineworkers but this does not seem to extend to the small mines. SACMS and its local offices are responsible for enforcing regulations on personal protection, dust, and noise in coal mines, but occupational health is not receiving the same high level of attention as safety.

Supervision of Small Coal Mine Operations

1.39 A significant proportion of China's coal output comes from small mines the regulation of which has proved problematic. Illegal operations by small mines are causing:

- loss of mineable reserves
- increased health and safety risks to legal miners, who can encounter unknown underground workings filled with methane or water
- disruption of coal markets and prices through increases in supplies of low cost, often low-quality coal
- unfair competition with legal mines because they do not incur the costs of complying with health and safety regulations or reclamation costs.

1.40 The problem is particularly acute in Shanxi, the largest coal mining province in China, where there are some 5,000 small mines. The Shanxi Coal Industry Bureau is unique in having established a "Supervision Team" in 1995 to check the credentials of coal suppliers, sellers, and users and to identify illegal mining activities. There is a total staff of 1,000 distributed at the provincial, prefecture, and county levels, with 145 small supervision teams across the coalfields. The fact that illegal mining continues and illegally mined coal is traded leads to questions about the effectiveness of the supervision teams.

Fiscal Aspects

1.41 Though allegedly reduced by more than 70 percent since 1990, government assistance to state-owned coal enterprises in 2001 totaled 13.8 billion Yuan (table 1.1). This is equivalent to a subsidy of 20 Yuan/ton of coal produced by the KSOCMs. In comparison to the large and medium state-owned mines, financial support for small mines has been minimal.

1.42 Among the current major expenses subsidized by the central government are pensions for retired miners from the KSOCMs, for which 5.7 billion Yuan have been contributed since 2000. To help cover future pension costs, China plans to sell government-owned stock overseas. The Beijing-based Shenhua Group is participating in the sale and plans to offer at least US\$1 billion of stock to global investors by March 2005. The omens are promising as shares in Yanzhou Coal Mining, the only Chinese coal producer that is publicly traded outside the mainland, have risen 159 percent in the past 12 months as higher global coal prices and stronger fuel demand boosted profit.

1.43 For the purpose of enhancing the construction of safety facilities and making technological improvements at the large coal mines, the government provided 540 million Yuan of state treasury bonds as subsidy funds and 790 million Yuan of loans at a reduced interest rate.

1.44 This policy is not intended to continue indefinitely. However, the state-owned coal mining enterprises are likely have continuing access to preferential loans to facilitate construction of new capacity to address government concerns regarding the inability of coal supply to meet rapidly rising demand.

Table 1.1. Government Assistance to State-Owned Coal Enterprises in 2001

	<i>Yuan billion</i>	<i>US\$ billion</i>
Exemption of loan payment	5.00	0.60
Debt to equity swap for interest cost relief	4.00	0.48
State treasury bonds and loans for equipment and technology upgrades	1.36	0.16
Welfare payments	3.46	0.42
Total assistance	13.82	1.67

Source: World Coal Institute newsletter, Vol. 46, June 2003

1.45 The tax regime was reformed in 1994, introducing a system that relies mainly on the value-added tax (VAT) with 75 percent of VAT paid to the central government and 25 percent to the local government. Proceeds from other duties, fees, and taxes are distributed between the central and local governments in various proportions, some depending on whether the enterprise is funded locally or centrally. The following taxes, duties, and fees are involved:

- **Value-added tax.** After the tax reform in 1994, the VAT rate of the coal enterprise was increased and was 8.61 percent in 2001, higher than in other industries where the rate ranges from 4 percent to 7 percent. The tax is reimbursed for exports.
- **Tariff.** The tariff is a state tax. Currently, the import tariff is 6 percent for steam coal and 3 percent for coking coal. With respect to exported coal there is no tariff and no VAT. The tariff rate for mechanical and electrical equipment imported for coal mines in China has been reduced to 15 percent. The tariff rate will be reduced to 10.2 percent by the year 2005 (8.65 percent for equipment imported from the United States) and 9.4 percent by the year 2008.
- **Enterprise income tax.** The new taxation system adopts a unified tax rate of 33 percent for all domestically funded enterprises. The income tax from state enterprises belongs to the central government, while the income tax from local enterprises belongs to the local government. This dual tax system can lead to unequal treatment of mines, as both the central and local governments have incentives to promote mines that generate income tax revenues for their administration.
- **Resources tax and resources compensation fee.** The resources tax is aimed at adjusting the income due to different grades of resources and is the tax on the resource product. The coal resources tax rate is 0.3 to 0.5 Yuan/ton. In addition, there is a resources compensation fee rate of 1 percent. The collected fee is shared by the central and local governments (central government versus provincial or municipal government: 50:50; and central government versus autonomous region government: 40:60). The income is included in the government budget and is mainly used for resources exploration. The resources compensation fee paid by the enterprise can be deducted as a cost.
- **Other taxes** include a stamp tax that is levied on documents; the amount payable depends on the financial value of the transactions and current tax law. A deed tax is levied on transferees of titles to land and property at a rate from 3 percent to 5 percent, the rate being decided by the provincial government.

2

Key Issues

Safety and Health in coal Mine

2.1 The primary reason for poor safety and health conditions in China's mines is not inadequacies in laws and regulations but the fact that they are not strictly implemented and the law is ignored. The problems are exacerbated by a lack of practical guidance on safe working methods, lack of investment in safety equipment, and the failure to develop and impose a safety culture. Difficult conditions in many mines contribute to the high annual accident rates in the Chinese coal industry:

- 95 percent of coal production comes from underground mines
- the average mining depth exceeds 400 meters
- 48 percent of the state-owned coal mines are classified as gassy or outburst prone
- coal in 58 percent of mines is prone to spontaneous combustion
- 88 percent of mines are considered at risk for dust explosions.

2.2 Gas explosions and roof falls are the major causes of fatal accidents (table 2.1).

2.3 From 1980 to 2002, overall fatalities in coal mine accidents in China have been reduced from 8.2 persons/Mt to 4.9 persons/Mt. During the same period, fatalities in KSOCMs were reduced from 4.5 persons/Mt to 1.3 persons/Mt, but those in TVCMs remained consistently high with 12.7 fatalities/Mt in 2002, and because of underreporting may be substantially higher.

2.4 Despite the improvements achieved, fatality rates in Chinese coal mines are still among the highest in the world. Average fatality rates of all coal mines in China are over 100 times larger than in the U.S. coal industry, and those in KSOCMs (which represent best China practice) are 30 times higher than in the United States.

Table 2.1 Fatalities from Coal Mine Accidents in China

<i>Category</i>	<i>Total</i>	<i>KSOC M</i>	<i>Small Mine Owned by KSOCM</i>	<i>SOCM</i>	<i>TVCM</i>	<i>Coal Mines under Construction</i>
Gas explosions	2,436	165	80	375	1,801	15
Falls of ground	1,879	287	36	392	1,149	15
Flooding	432	25	19	56	318	14
Transport	495	159	5	103	217	11
Mechanical and electrical	99	36	0	25	37	1
Blasting	70	17	1	14	36	0
Fire	84	8	54	4	17	10
Others	175	52		38	70	27
Fatalities/megaton	4.9	1.2	-	4.6	11.8	NA
Total fatalities	5,670	749	200	1,007	3,645	69

KSOCM, Key state-owned coal mine; SOCM, state-owned coal mine; TVCM, township and village coal mine; NA, not applicable.

Source: Official 2001 statistics.

2.5 China relies on statistics to monitor the effectiveness of safety legislation and its enforcement in common with other countries. However, it differs from the developed countries in that the statistics are also used to set safety targets for mining companies. The KSOCMs provide the benchmark safety standards for China, but even they view the safety performance of international mining companies as beyond current capability. A major hurdle to further improvement is the largely reactive nature of the mine safety legislation. Similar legislation was applied in the United Kingdom to the national coal industry prior to 1975 and did not produce the required results because of an overabundance of prescriptive and rigid regulations that discouraged people from thinking for themselves. Managers relied on outside regulators to tell them what to do rather than defining and regulating their own safety performance. China is at a similar stage. This highlights a need to overhaul the legislation.

2.6 GoC policy is to significantly reduce the number of workers at risk per ton of coal mined by replacing manual mining with mechanized mining methods. One way this is being achieved is by the transformation and consolidation of small mines into modern industrial-scale mines. For example, the Tianchi case study mine (annex 4) will produce eight times more coal for a 1.4-times increase in numbers of employees. Technical safety improvements in the new mine compared with the former small mines included an improved ventilation system; dual power supply to reduce the risk of hazardous

ventilation stoppages; replacement of timber roadway supports by bolts, mesh, and shotcrete; and a comprehensive safety monitoring system.

2.7 The State Council has allocated US\$265 million for expenditure in 2004 to help improve coal mine safety, particularly with respect to mine gas control. This will complement US\$481 million of state bonds spent in improving coal mine technology in the past two years. Investigation and response procedures for major accidents have also been strengthened. In addition, the GoC has stepped up efforts to punish negligent workplace managers. For example, following the death of 72 workers in a gas explosion at a mine in China's central Shanxi Province, the owners of the mine were fined a record US\$2.6 million for their role in the accident.

2.8 Safety management systems using the "carrot and stick" approach are now mandatory in the large mines. For example at the Shuangliu case study mine the safety status of the teams is divided into four ranks, A, B, C, and D on a daily basis. If a team is evaluated as rank A, 85 percent of the members of the team (17 out of 20) would each receive 50 Yuan if some "hidden safety troubles" occurred for three consecutive days, the team bosses would each be fined 100 Yuan. If a fatality occurred in the mine, all the employees would have their wages reduced by 15 percent. Small mine operators do not have the necessary management skills and knowledge to devise and implement such arrangements.

2.9 The county magistrate and deputy magistrate with responsibilities for the industry, the director and deputy director of safety, and the deputy director responsible for the accident site in the mine will lose their jobs if three or more fatalities occur. There are signs that these penalties are being exacted, which is raising the level of accountability for safety to include key decisionmakers, an important step forward. By applying this stricture to all mines, the authorities are placed under increasing pressure to address the safety problem in the small mines. Shortage of inspection and enforcement staff has yet to be resolved but this measure may help to ensure the closure of illegal mines.

Safety Regulation of Small Mines

2.10 Of the very serious and extremely serious accidents (10 or more fatalities) in 2002, 38 percent occurred in TVCMs that had passed inspection checks and 29 percent occurred in mainly small SOCMs. Reasons for these problems with small mines, illustrated in ESMAP program studies in Shanxi province (annex 4), include: engaging in a form of protest by using the above labels to stigmatize communities as irrational and selfish.

- Some county and township governments do not fully understand how to implement the necessary safety improvements, others appear to ignore them and law enforcement is inadequate.
- Many TVCMs seek to maximize coal production regardless of safety, especially when market conditions are good.

- Some counties and townships falsely certify that necessary improvements have been carried out in mines which do not comply with the required safety standard.
- Mine management is inadequate, safety facilities are poor, and miners are not trained.

2.11 Enforcement of safety legislation in small mines is a major challenge for the inspectors. At the beginning of 2003 there were over 25,000 small mines requiring inspection—an impractical task with 2,600 inspectors available. The demands of the small mines that need the most attention are difficult to meet, and at the same time these demands divert effort from the larger mines that still need to improve their safety records to approach international standards.

2.12 Sanctions that can lead to stoppages of all coal mining (except KSOCMs) throughout a province with penalties for government and mining officials in the event of serious accidents appear to have been effective in raising safety standards in some areas (annex 4). As local governments in some mining areas depend strongly on small mines for revenue, and locals depend on them for employment, permanent closure has been difficult. A solution to the safety problem therefore hinges on a solution to the economic and social issues associated with small mine closure.

Community and Occupational Health

2.13 Health problems associated with coal use are evident in the populations of many cities as well as among mine workers. More than 70 percent of China's coal is consumed within urban areas. Pulmonary disease, closely related to air pollution from coal burning, is the largest single cause of adult deaths in China (26 percent of total). Of the 338 cities in China that have statistical air quality data, two-thirds do not attain the national ambient air quality standards for urban areas (second-class standards), and 40 percent of the cities cannot meet the ambient air quality standards for industrial areas (third-class standards). Cheap, low-quality, unwashed coal is often burned on open fires and in rudimentary stoves in low-income family homes and in makeshift dwellings of itinerant workers on the edges of many cities, causing serious pollution at low level often exacerbated by temperature inversion effects. In 1995, respiratory diseases were the leading cause of death among village inhabitants at a mortality rate of 169 in 100,000.

2.14 About 40,000 new cases of occupational lung disease occur every year in China, many of which are coal mining related. Not only is the number of reported new cases increasing at more than 15 percent every year, but also progressively younger workers are being affected, some as young as 24 years old with dust exposure periods of less than three years. According to an investigation conducted in 1996, 53,700 miners were suffering from lung diseases in large and middle-sized mines, and some 3,000 were dying from the disease each year. Nearly 20 percent of all workers in China's coal mines over the age of 40 suffer from occupational diseases. About half the total cases in the coal industry are distributed in Sichuan, Liaoning, Hunan, Shanxi, Jiangxi, and Heilongjiang.

The cost of treating these occupational diseases, estimated at 6 billion to 7 billion Yuan annually, has a major economic and social impact.

2.15 Occupational diseases are caused by high concentrations of mining dust and other toxic substances, unhealthy working conditions, inadequate protective equipment, and lack of proper training. The two major debilitating diseases are pneumoconiosis (coal dust related) and silicosis (quartz dust related) but official statistics do not discriminate between these diseases. China has taken some steps to rectify this situation. China's Law of Occupational Disease Prevention and Treatment went into effect on May 1, 2002. This law requires employers to make workplaces safe and provide workers' insurance. Workers will also be able to seek legal aid if their right to work under protection from a dangerous environment is violated by employers. How this will be achieved in practice is unclear, particularly in the small mines where there have been accounts of complainants and their families being bullied and threatened by unscrupulous small mine operators.

2.16 The national statistics point to an urgent need to increase health standards in all mines. In some small coal mines, the density of dust particles was found to be 130 times the state standard, which demonstrates the inadequacy of ventilation controls and reinforces the need for stricter enforcement of health and safety legislation in small mines. The MOH is responsible for monitoring the health of miners but does not collate statistics on the incidence of lung disease among workers in small coal mines. There is therefore a strong likelihood that many miners in TVCMs and small-scale SOCMs are affected by chronic and severe lung conditions for which they will receive no treatment or compensation. The institutional framework clearly needs to be strengthened to improve the link between MOH, which monitors health, and SACMS, which inspects and enforces health protection in mines, to increase the effectiveness of preventive measures.

2.17 China has sought to widen dissemination of knowledge on occupational health issues and has undertaken research, founded training centers with assistance from the United Nations Development Programme (UNDP) and the International Labor Organization and established national institutes for labor protection and occupational health as well as corresponding institutes at the provincial and city levels.

Environmental Protection

2.18 While China has only 10 percent to 20 percent of the environmental laws and regulations of major industrialized countries, it does not follow that simply adding more laws and regulations will solve China's serious environmental problems. The more pressing problem is the lack of proper monitoring and consistent enforcement of existing environmental laws and regulations. SEPA and local EPBs have a vast array of industrial processes to understand and monitor. The coal mining sector is only one of many industries impacting China's natural environment, and many of the shortcomings of environmental regulation of coal mines also occur in other industries.

2.19 Coal mining destroys water resources in the mining areas, occupies and pollutes land with mine waste, and causes subsidence damage to the surface. A study on the

environmental impact of coal mines in Shanxi Province, which accounts for some 25 percent of China's total coal output, revealed that:

- 13 percent of the total land area is affected by coal mining
- 650 km² of land are subject to subsidence
- more than 200 km² of land are occupied by mine waste tips totaling more than 270 Mt
- more than 20,000 km² of land require rehabilitation as a result of coal mining
- less than one-fifth of the land affected by mining has been reclaimed.

2.20 Domestic experts consider that surface subsidence caused by coal mining in China is comparatively serious, especially in eastern regions, such as Shandong and Anhui, where the land is flat, mostly arable, and financial loss is larger than that in the mountainous Shanxi in the west. Central and local land reclamation and treatment regulations have not been effective. Until recently, governments at the various levels and land administration departments paid little attention to land reclamation and its supervision. However, they are now realizing the importance of land reclamation. Whether revised regulations can be translated into action is uncertain as the issue of funding remains.

2.21 Mines having caused damage to land are responsible for its reclamation in accordance with a principle established by the State Council (October 21, 1989) and also in accordance with the regulation "Provisional Management Means for Environmental Protection of the Coal Industry" (former Ministry of Coal Industry, 1994). The land and resources bureau is responsible for supervising reclamation, and the mining enterprise is required to draft and implement a reclamation plan. A mine has the option of undertaking reclamation works itself, appointing a contractor, or paying the mine reclamation funds to the land and resources bureau, which then appoints a specialized contractor. However, reclamation plans invariably fail to be completed because of the lack of finance. Land reclamation fees are paid in part by financially sound coal enterprises and partly by local government. Coal enterprises in a weak financial position do not contribute at all. This is an unacceptable practice in a competitive and environmentally responsible market. Mines that cannot afford to pay for environmental protection should be closed and their assets liquidated. Land-use funds held by local government are not generally used for restoration. Due to the tight budgets, these funds are used for other purposes. There are no budgets for reclaiming land that was mined prior to introduction of the reclamation regulations. Consequently, land reclamation and restoration rarely take place.

2.22 The few reclamation schemes that have been implemented are small relative to the scale of affected areas, and costs far exceed current land reclamation fees. For example, 15 square kilometers of 47 square kilometers have been reclaimed by Feicheng Mining Group, Shandong, at a cost of 45 Yuan/square meter (annex 4). Shandong

Province currently has a total of 300 square kilometers of subsidence areas, of which about 27 square kilometers have been reclaimed. Reclamation fees are 15–18 Yuan/square meter for deep subsidence (8–9 meters), 7.5–9 Yuan/square meter for middle-depth subsidence (5–6 meters), and 3–4.5 Yuan/square meters for shallow subsidence (1–2 meters). In a revision of land regulations, Shandong Land and Resources Bureau is planning to issue a document that specifies a land reclamation fee of 1.0–2.0 Yuan/ton. Realistic subsidence and restoration costs need to be considered at the feasibility study stage, and these costs should be fully carried by the mining operation. At present, coal production is effectively being subsidized at the cost of the environment.

Environmental Impact of Small Mine Operations

2.23 Environmental effects of TVCM activities are likely to have widespread and long-lasting impacts, including destruction of arable grazing land through:

- accelerated erosion of topsoil
- landslides
- collapse of old workings
- dumping of tailings
- lowering of water tables
- contamination of soils by dust from mines
- increased levels of sediment load and flooding in adjacent rivers
- disturbance of the local water table.

2.24 An analysis of statistics from 1995 indicates that coal-producing town and village industrial enterprises (TVIEs) lead the discharge of solid waste and that township and village mines are major contributors to waste water disposal. Furthermore, the cement, brick, tile, and ceramic plants at the township and village level, many of which are fueled by poor-quality coal from TVCMs, constitute a major source of atmospheric pollution. Some 60 percent of the solid waste discharged from TVIEs is reported from just five provinces, Shanxi, Yunnan, Hunan, Hebei, and Sichuan, all of which have important TVCM activity. Roughly half of this discharge occurs in Yunnan and Shanxi. It is therefore probable that a significant amount of the solid waste pollution generated in these five provinces originates from TVCMs.

2.25 Although little surface subsidence would be expected over the areas recently worked by small mines, supporting coal pillars in the underground workings can deteriorate over time, leading to localized collapse and subsidence. Land could inadvertently be developed for construction over workings that are inaccurately mapped, or not mapped at all. Unpredictable ground failure could damage buildings and infrastructure. Where there are many small mines, large areas could be blighted.

2.26 While the GoC policy to close unsafe and illegal TVCMs will reduce environmental degradation of land and coal resources, replacement of coal production capacity by large industrial mines has an environmental price. Introduction of longwall caving in place of the room-and-pillar mining method used in most small mines will impact the surface environment as a result of subsidence. However, the effects are well known and can be monitored, and the impacts controlled. The change to longwall caving will also increase greenhouse gas emissions as longwall faces disturb more gas-bearing strata than the noncaving methods of mining used in small mines. However, gas drainage and utilization in the large mines can mitigate this effect substantially. Small mines do not practice gas drainage and would be unable to finance any gas emission reduction technology.

Weaknesses in Coal Mining Sector Environmental Protection

2.27 Observations, reports, and consultations indicate the following principal weaknesses with respect to coal mining:

- Many enterprises have insufficient resources, knowledge, and technology to meet the environmental protection standards in developed countries.
- For many inherited environmental problems (for example, subsidence damage and tips of mine waste), the responsible local authorities have neither the ability nor financial resources required for mitigation.
- Technology for pollution treatment is inadequate or outdated.
- Some legislation is too general and provides insufficient guidance on how to apply it in practice.
- Legislation is incomplete, for instance there are no legal stipulations concerning the management of mine construction and closure.
- Some state laws and regulations concerned cannot be implemented (for example: the demarcation of responsibility and right of land reclamation; sustainable economic plan and policy support of city and regional resources; and the policy to promote development of clean coal technologies).

2.28 Coal utilization receives substantial attention from SEPA and its EPBs due to air quality concerns but environmental protection at mines is left to mining companies and coal administration departments to implement and monitor, other than for the review and approval of EIAs.

2.29 Nevertheless, the introduction of EIAs is a positive step but the process needs to be improved. The relatively short monitoring periods used in gathering data for EIAs as illustrated in the case studies (annex 4) would not satisfy environmental and planning

authorities in developed countries. Internationally accepted procedures would require conditions relevant to all seasons to be monitored. However, at least the principle of measuring baseline conditions has been established in China. At present, EIAs prepared as part of mine construction project studies are often treated as a procedure to obtain needed licenses to develop a mine, rather than as an important document that will be used in mine design, development, and operation.

2.30 The current administrative process to ensure that land affected by mining is restored is ineffective and needs urgent overhaul. There is a strong case for introducing restoration bonds, which are lodged prior to the start of mining, so that they can meet any failings by the mine after closure. Shandong Province has introduced this requirement. All fees designated for postclosure environmental protection should be paid in full to the land and resources bureau, which is responsible for managing all postclosure liabilities, including restoration, and the bureau should be held accountable to a higher authority. There are no severe penalties for a mine that fails to meet its reclamation obligations, and, even if there were, the mine may not have enough funds to pay. However, with proper enforcement, prices would rise to a level that would cover the additional costs for restoration. Mines or companies unable to meet these costs should either be sold along with the liability or closed and their assets liquidated. No party is accepting responsibility for postclosure surface hazards (gas emissions, surface collapses, and mine water emissions). In fact there is no recognition of the potential problem. An investigation of the potential magnitude and extent of these liabilities would be a useful first step. While these problems could arise at any size of mine, they are likely to be the most acute around closed KSOCMs in populated areas.

2.31 More effort is needed to raise the environmental awareness of mine management, local government, and the community. The main concern of local authorities is on coal production as an essential revenue source. Attention to environmental matters tends to be superficial. Local officials should be held accountable for the environment in addition to mine management. Strong enforcement should become an essential component of effective environmental regulations and land reclamation guarantees. Noncompliance should attract substantial financial penalties. At present, monitoring and supervision of the activities by the EPBs is weak at large coal mines and nonexistent at small mines. Research should be carried out to improve the understanding of the environmental impact of small coal mines and enable effective controls to be designed.

Cleaner Coal Use

2.32 Government policy and SEPA's initial focus was on monitoring and control of discharges and emissions but attention is now turning to controlling pollution at sources. The main priorities are improvement of air and water quality. The coal market will become increasingly sensitive to coal quality as the government's clean energy policy and Clean Energy Action Program gain momentum.

2.33 Although mines which produce coal with more than 3 percent sulfur have been closed, coals containing up to 3 percent sulfur are still mined. Emission charges, where

levied, are not a deterrent but only suppress the price. At present, high-sulfur coal tends to be cheaper and hence more attractive to local consumers than cleaner coal. Domestic, industrial, and local authority consumers are reluctant to pay the higher price of washed coal with its lower ash and sulfur contents. Coal washing is therefore mainly limited to metallurgical grade and export coals. Environmental policy and action is needed to tackle this difficult issue. Regulations preventing the use of inferior coal, other than in an advanced clean coal technology combustion system with appropriate emission controls, are urgently required. Enforcement at the consumer end would be impracticable given the large numbers of domestic customers. Therefore, effective regulation will require supply-side controls. Regulations requiring major industrial users to use cleaner coal have been introduced in some large cities but such methods are ineffective in the countryside and poorer regions. The ability of coal mines to produce high-quality coal, low in sulfur and ash, and the market to support a price structure that recognizes a premium value for clean coal, are important factors in the drive to improve air quality in Chinese cities.

Restructuring and Rationalization

2.34 The “Tenth Five-Year Plan for the Coal Industry” (2001–2005) states that “coal enterprise transformation” should be promoted in accordance with the requirements of a modern corporate system. Large coal enterprises should be transformed into share holding or limited liability companies, or into Sino-foreign JVs. State-owned middle-size and small mines should be combined into larger entities by merger, acquisition, or other means. The government envisages increased private shareholding but retention of control. From a financial point of view, it makes sense for private and public investors to support the consolidation of large coal reserve blocks, as this practice can justify the substantial investments that large-scale, advanced coal mining requires. By the end of 2001, most of the 94 KSOCMs had been transformed into limited liability companies and 10 coal enterprises (including local state-owned coal enterprises) listed on domestic and foreign stock exchanges. China should benefit from the increased scale, provided the new organizations are rationalized.

2.35 Some of the larger state-owned coal mining companies are divesting themselves of noncoal-related businesses that were developed to provide jobs for surplus staff and income to offset unprofitable mining activities. SASAC is managing the disposal of the saleable peripheral business assets. Current government policy is to promote integration of large-scale coal mining groups with downstream coal use such as coal chemicals and power generation. An important benefit is cross-sector financing with power companies investing in new mine capacity and mines building power plants. While the large, financially strong mining groups can follow this path, lesser state-owned mining enterprises continue to seek investments in lower cost but unrelated sectors thus diverting their attention from the urgency of improving the performance of their core business. For example, 39 percent of the projects in a 2004 prospectus inviting foreign investment in China’s coal industry are noncoal related. Such investment activity should be discouraged as it is counter to the rationalization needs of the industry.

2.36 State-owned coal mining enterprises carry a heavy burden of social costs for hospitals, schools, public security, environmental hygiene, and utilities. According to the 1998 coal industry statistics, these costs amounted to about 5.7 billion Yuan in 1997. The social assets and infrastructure supported by the mine should be transferred to local authority ownership and merged with existing community services. Miners' incomes should then be reviewed and account taken of their need to purchase public services in line with the rest of the community. A particular problem is the large number of retirees whose pensions represent a substantial operating cost to the mining enterprise. This, however, will be less of a problem in the future as retirement funds have been established for the present workforce.

Consolidation and Transformation of Small to Large Mines

2.37 Consolidation and transition from inefficient, small-scale to modern, mechanized, large-scale mining has proved to be effective in creating safer and more efficient mines, maintaining county revenues, reducing wastage of coal resources, introducing responsible environmental management, and promoting local economic and social development. This process is exemplified in case studies made of two mines, Tianchi and Shuangliu in Shanxi Province (annex 4). Tianchi mine was at an advanced stage of planning and Shuangliu is a fully established working mine. Tianchi involved a majority acquisition of a small county mine by a large state-owned mining company (Yankuang Group) from another province. Shuangliu was identified by a large local state-owned mining company (Fenxi Mining Group) operating in the same county. The two mines operate in different business environments—one “protected” by the provincial government, the other effectively a “private” operator within the province. The case studies show there will be a fivefold improvement in safety and a sixfold increase in productivity as a result of the transformation and consolidation of the original small mines. In addition, a wide range of positive benefits arise from the consolidation and transformation of small mines into industrial-scale mining operations (table 2.2). These same advantages will apply to any replacement of small mine capacity by large mine production capacity. Essentially, the aim should be to apply the best features of KSOCM management, planning, operating, and welfare practices to all coal mines.

2.38 Other successful small-to-large mine consolidation and transformation examples include Shenhua Group's Yujialiang mine in Shaanxi. Yujialiang mine achieved a production of over 10 Mt in 2002 after upgrading the original 1-Mtpa capacity mine. Twenty-four nearby small mines were closed. Thus, a basis is established for rationalization and modernization of China's coal mining sector. The process is in direct accord with national policies to close hazardous and inefficient small mines, to improve mine safety, and to develop a sustainable coal mining industry. However, consolidation and transformation is not a universal panacea. Geological problems, poor coal quality, and lack of market access will exclude industrial mining as an economically viable option in many areas, particularly in southern China. The process is also inappropriate where coal reserves have been destroyed by indiscriminate small-scale mining, unless substantial economic reserves are still intact at greater depths.

Table 2.2. Benefits of Modern Industrial-Scale Mining Compared with Small-Scale Mining

<i>Category</i>	<i>Benefits</i>
Coal resources	<ul style="list-style-type: none"> • More efficient exploitation of coal resources
Health and safety	<ul style="list-style-type: none"> • Less men exposed to risk of death and injury per unit mass of coal mined • Safer, less strenuous, and healthier working conditions • Personal protection equipment provided • Medical treatment facilities
Management	<ul style="list-style-type: none"> • Responsible and experienced management • Incentive of career progression
Productivity	<ul style="list-style-type: none"> • Increased production efficiency through mechanization
Training	<ul style="list-style-type: none"> • Induction and refresher training, both safety and skills related for management and workers
Employment	<ul style="list-style-type: none"> • Higher salaries and wages • Sustainable jobs • Personal development opportunities • Unemployment, accident and health insurance, and pension provisions • Suitable work-wear provided
Technological innovation	<ul style="list-style-type: none"> • Research and development affordable • Able to monitor and exploit advances in mining technology
Coal quality	<ul style="list-style-type: none"> • Coal preparation can be used to improve coal quality and hence reduce transport movements and cost as well as improve air quality at the location where used
Environment	<ul style="list-style-type: none"> • Environmental impact assessed before construction and emission limits set • Monitoring and mitigation of environmental impacts practicable • Concentration of activities in a limited, controllable area compared with widely scattered small mines
Local economy	<ul style="list-style-type: none"> • Provides quality jobs • Local transport and communications infrastructure enhanced • Stimulates a secondary economy in the local community providing services to the large mine and its workforce

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Local Economic and Social Impact

2.40 The construction of new large mines and the consolidation and transformation of small, inefficient coal mines into large industrial-scale mines operated by responsible mining enterprises will bring essential investment, health and safety, technology, environmental, economic, and social benefits to local communities.

2.41 A more responsible approach to environmental protection by large mines compared with small mines, and better control of coal quality, will benefit the overall health of local communities. For example, pollution from coal mining, adverse hygiene, poor nutrition, and lack of education have contributed to an anomalous incidence of birth defect problems in Shanxi Province. Economic development aided by the introduction of industrial mining helps to alleviate such problems through increases in income, opportunities to develop service industries, and the raising of educational standards among locals employed at the mine. An influx of educated engineers and technicians will also help to raise overall educational standards in the area.

2.42 Local mineworkers will have improved working conditions, better health, safety and hygiene, less physically arduous tasks, and a higher income than was possible with the small mine. Welfare provisions include health, unemployment insurance, and pensions. Thus, the miners' families will benefit. Health screening and the availability of medical services will ensure better health among the local workers. Workers in small mines would not receive this level of welfare support.

2.43 Nearby villages will benefit considerably from the increased spending power of miners and provision of services to the mine. In 2001, the average monthly salary of miners (all grades) was only 800 to 900 Yuan. However, salaries of workers in new, modern, industrial-scale mechanized mines are substantially higher than those of workers in small mines, by as much as six times (annex 4). The disposable incomes of the 650 workers at Tianchi will thus increase by nearly 6 million Yuan and stimulate the local secondary economy, including development and expansion of service industries, restaurants, and quality housing. A new nearby railway, which has a design capacity of 17 Mtpa but currently carries only 7 Mtpa coal, will gain new business. Provision of construction materials will enhance activity in local quarries, cement and lime plants, and

road transport companies. Coal sales will yield some 29 million Yuan/year in local taxes. VAT paid to central government will amount to about 4.3 million Yuan.

2.44 In coalfield areas with natural advantages and far-sighted local government, redeployment of workers from closed small mines into alternative economic activities including large mines may be practicable as illustrated by the case studies (annex 4). In other areas, local governments will have less favorable situations and many may lack the resources, know-how, and the encouragement to plan economic, social, and environmental mitigation measures prior to small mine closures. Failure to plan for closure and diversify the local economy will inevitably lead to the continuation of illegal mining, unacceptable numbers of fatalities, increasing poverty, and continuing environmental damage.

Mine Closures

2.45 Mine closures are an inevitable consequence of the coal sector restructuring process in moving from a command and control to a market system.

2.46 The GoC has implemented mine closure policies to address two separate issues:

- closing and bankrupting of state-owned coal mines with no commercial future; and
- closing of small mines that fail to meet safety, licensing, and resource access criteria to prevent overproduction.

Closing and Bankrupting of State-Owned Coal Mines

2.47 China has many coal mines with depleted reserves, high-ash and high-sulfur coal, and no possibility to be profitable, some working in difficult geological conditions. In 1999, the State Council decided to close coal mines that met the following conditions:

- less than 5 years' reserves remaining
- an ash content higher than 40 percent, and/or sulfur content higher than 3 percent
- operating unprofitably for several years, with little chance of improvement.

2.48 A plan was formulated for closing and bankrupting more than 120 coal mines in stages. These coal mines had a total production capacity of 90 Mt, employing 720,000 persons, including 450,000 retired persons, and incurred a total loss of 4.0 billion Yuan annually.

2.49 Since 1999, the GoC has approved the closing and bankrupting of 65 coal mines with a total capacity of 40 Mt. The actual coal production of these mines in 1998 reached 25 Mt. Total losses were 2.5 billion Yuan, employees numbered 397,000, including 253,000 retired. For these coal mines, 9.0 billion Yuan of debt was written off. The governmental subsidy was expected to reach 13.6 billion Yuan by 2002. The major policy documents regarding the closing and bankrupting of state-owned mines are listed

and described in annex 1. Government advisers estimate that KSOCMs with a total production capacity of some 150 Mtpa will close between 2002 and 2010 due to resource depletion.

2.50 The government recognized that the process of closing and bankrupting state-owned coal mines would lead to social hardship due to the large workforce involved and the locations of many mines in remote areas far from cities and alternative employment. Policies were introduced to ameliorate the social impacts with respect to:

- costs for staff resettlement
- treatment of the issues regarding coal enterprises' social business
- management of retired persons, particularly concerning pensions
- treatment of issues regarding projects with loans for tertiary industry
- debt treatment
- early retirement options (up to five years after approval of bankruptcy)
- personal insurance provisions.

2.51 While some provisions are made, observations indicate that current social mitigation measures are not sufficiently effective in creating new job opportunities. Jobs are created at closed mines that have no real economic benefit, and in some instances illegal mining supplements incomes. Such activities lead to increased costs and additional safety risks and should be discouraged.

2.52 The physical process of mine closure should be more tightly planned and executed. An environment appraisal should be undertaken to assess surface stability, gas emissions, and mine water recovery aspects, including the identification of any necessary control measures. A schedule and timetable should be prepared and approved by the coal mining administration. The schedule should demonstrate that the closure and sealing will be undertaken systematically and swiftly. Thus, financial resources can be directed toward providing retraining and developing legitimate job creation schemes for sustainable businesses.

Closure of Small Mines

2.53 In 1983, the State Council enacted legislation to encourage rapid expansion of small mine enterprises to meet a coal supply shortfall. Local coal sector administration departments were instructed to assist the process. Rapid expansion ensued, and coal supplies grew as required. From 1980 to 1986, the annual output of the TVCMs rose from 100 Mt to 300 Mt, and their contribution to China's total coal output increased from one-sixth to one-third. The output of TVCMs peaked at 638 Mt in 1996, representing 46 percent of the national total raw coal output. Unfortunately, the authorities did not have the capacity to control the mines in accordance with the legislation. The mines were

commercially successful, but had little regard for licensing, safety, and environmental protection legislation. They had an unfair competitive advantage over larger mines, which had to bear the costs of compliance with legislation. Their output depressed coal prices, which was detrimental to the financial performance of the state-owned mines and discouraged foreign investment in coal mining. In addition, the TVCMs had an abysmal safety record. Large-scale closure seemed the only way to bring order to the coal mining sector. A plan was announced by the central government to close some 25,800 illegal and “irrational” mines (mainly TVCMs) by the middle of 2000 in order to reduce output by 250 Mt per year. Categories of TVCMs targeted for closure included:

- 1) mines with neither mining nor production licenses
- 2) mines opened within the areas of state-owned mines since January 1, 1997, that, by law, could not have been granted a mining license
- 3) mines opened within the areas of state-owned mines before January 1, 1997, that had mining licenses but lacked production licenses
- 4) mines opened within the areas of state-owned mines before January 1, 1997, that had mining and production licenses but had a negative impact on the state-owned mines
- 5) mines exploiting coal with high sulfur and ash content, and without appropriate countermeasures
- 6) mines operating outside the areas of state-owned mines that had mining licenses but no production licenses.

2.54 In accordance with government policy, compensation would be paid only to mines in category 4, as they were the only fully legitimate mines on the list. Mines in category 6 were given the opportunity to raise their technical and safety standards and apply for a production license before the end of February 1999. The smaller mines in this category were encouraged to merge with other mines to provide the financial and technical benefits of scale. The principal regulations, documents, and procedures relating to small mine closure are summarized in annex 1.

2.55 Provincial governments were charged with formulating the compensation policies for the category 4 mines. In Jiangsu, for example, the government decided that 100,000 Yuan should be paid for each 10,000 tons of capacity closed. However, there are indications that few provinces declared a compensation policy, let alone actually paid out money. No compensation appears to have been offered to owners of mines in other categories. Private individuals and local governments, many of whom had invested in good faith, believing that their enterprises were legitimate, have lost substantial amounts of money. At present, legal claims through the courts are not a practical option.

2.56 A number of parties suffer a negative impact from the small mine closure campaign in the absence of any planning for mitigation. Those affected include:

- local government, which experiences a decline in revenue thus reducing its capacity to invest in new infrastructure and facilities
- mine owners, including local government owners, who receive little or no compensation for lost assets and are only entitled to compensation if deemed a wholly legal operation (the potential loss of all assets is a deterrent to investment in improvements in remaining small mines)
- redundant mine workers who have few opportunities to find sustainable, alternative employment
- local farmers for loss of compensation for use of land by TVCMs and no likelihood of reclamation or rehabilitation of polluted land and water
- local energy users who, in the absence of locally available low-cost coal, may be tempted to cut down trees for firewood and damage the environment

2.57 Against these negative impacts of the closure campaign, all levels of local government are making substantial efforts to raise the standards of the remaining small-scale coal mines.

2.58 It was reported that 33,000 mines had been closed by the end of 1999, reducing annual output by 300 Mt. By late 2001, the total number of TVCMs had reportedly been reduced to 23,000 resulting in a reduction in annual production from 620 Mt in 1997 to 200 Mt. Mine closures were undertaken by county-level government agencies, where there were often conflicts of interest. On the one hand, closure of some TVCMs provided protection for county-owned state mines; on the other hand, TVCMs provided an important source of employment and revenue from taxes and fees. As a result, it is likely that the actual extent of mine closures and production abatement is significantly less than reported. Official figures show a sharp divergence from 1998 between rapidly declining coal production and only modestly declining coal consumption. The magnitude of this divergence suggests that there was greater coal production, presumably from TVCMs and stockpiles, than officially reported. For example, official coal production in Shanxi in 1999 was some 93 Mt less than the total amount of coal consumed and exported from the province. Some year 2000 estimates of coal production determined by comparing supply and sales data suggested a total output of 500 Mt from China's TVCMs, whereas the official statistic based on local government estimates was about 200 Mt. This difference is a result of false statistics, a consequence of political pressure on local governments to demonstrate successful reduction of coal production from small mines to fulfill planned targets. At that time some of the working mines would have been illegal by present standards, so it is difficult to estimate how much illegal coal was mined overall in China. A national survey was undertaken of the number of illegal coal mines that are secretly operating but the results have not been disclosed—except for fragmentary information

released in Hunan Province. A survey of small coal mines in Hunan Province, conducted in May 2001 by the State Coal Mine Safety Supervision Bureau found more than 4,000 small coal mines in operation. As some 2,933 were operating at the end of the enforced closure program in 1999, the survey suggests that more than 1,000 small coal mines had resumed production within about one and a half years of closure. This provides strong evidence that strengthening of ongoing monitoring and enforcement is essential to halt illegal mining. As a result of the survey and unacceptably high fatality rates, the central government issued a circular on June 13, 2001, ordering the suspension of small-scale coal mining operations, both those run by state-owned companies and those run by township and village enterprises. Only the licensed mines that passed the inspections of the relevant authorities were permitted to recommence operation. In November 2001, five coal mine explosions occurred over a span of one week in Shanxi Province; the death toll was nearly 100. All small coal mines in the province were ordered to stop production, and MOLAR issued "Instructions for Further Strengthening the Order in Mineral Resources Operations."

Rationalization of Labor

2.59 Mine closures as well as mechanization and modernization of the coal mining sector are inevitably reducing the number of miners needed. There are two aspects to consider. First, large state-owned mining companies are carrying surplus employees, thus hindering availability of investment for the development of new coal resources. For example, Yankuang Group has a burden of retired pensioners and some 90,000 employees yet only about 30,000 are needed to maintain mining activities. Second, local governments faced with opportunities to replace small mines with large mines are eager to maximize employment of redundant workers from the small mines. Not all the former employees may be suitable for transfer because of poor education and lack of experience with modern, mechanized mining technology. There is therefore a danger of overstaffing, which must be avoided as it is inconsistent with the aim of developing an economically sustainable coal mining sector. Alternative employment is urgently required together with retraining schemes in all coalfield areas where mines are being closed irrespective of size, although the need is likely to be most acute where large numbers of small mines have been closed.

Full Private Ownership

2.60 The avowed intent of the GoC is to maintain control of the major coal mining enterprises but allow increased shareholding in these as well as allowing coexistence with a private sector. Wholly private ownership of coal mines is mainly limited to small mines although some private companies are seeking to expand and transform some of these into larger mechanized operations. The provincial-owned coal mines in Guangdong Province withdrew from the state-owned sector in mid-2002 and transformed to a private and share cooperation system. The city-owned and county-owned coal mines will follow.

2.61 The view of small coal mines in China is that they generally are badly managed, unsafe, and recover a low percentage of the coal reserves. The fact that some are

successful in applying for operating licenses and have passed safety inspections indicates that they can meet current standards. While illegal mining cannot be justified, legal small mines increase competition in the coal sector, often respond quickly to changing market conditions, and should be encouraged, but only within an effective regulatory environment.

Supply Shortages

2.62 A shortage of coal supplies in China in late 2003 is symptomatic of the present situation, which is likely to deteriorate. The shortfall is attributed variously to large increases in domestic power demand, closures of small mines, production losses from small and medium mines while safety improvements were being made, and rail transport logistics problems. High coal prices in 2003 resulted in record coal production. KSOCMs expanded production by 14 percent from the previous year compared with TVCMs, which achieved a 24 percent increase despite continuing closures and safety stoppages. To help redress the shortage, some export coal was diverted for internal use, creating shortfalls on the Asia coal market. Coking coal imported from Australia is making up shortfalls in the steel sector. A 120-Mt shortfall in China's coal production has been predicted for 2004. The State Grid Corporation predicts power demand in 2004 in China will rise 11 percent to a record 2.09 trillion kilowatt-hours, and capacity is not expected to catch up with demand until 2006. According to domestic experts, China's coal demand will grow to 1.8 billion tons by 2010.

2.63 Part of the problem is the lack of a free market in the power supply sector. China abolished state pricing of coal for electricity generation in 2002 but the electricity price is still set by the government. It is therefore difficult for electricity-generating companies to meet coal price increases. At a national coal-ordering conference at the end of 2002, the electricity-generating companies only signed agreements worth 100 Mt of coal with those coal producers that had not raised their price, leaving a gap of 150 Mt unfilled. Mines were only prepared to sell the contracted amount at the agreed price, preferring to sell additional coal at the higher market price. From January 2004, the price of contracted coal for power generation will be allowed to increase up to 12 Yuan/ton (including tax) on the price base of 2003, and the state-regulated electricity prices will increase by a small 0.7 Fen /kilowatt-hour (0.085 US cents/kilowatt-hour). The government is expected to continue to restrict coal exports in 2004 to ensure internal demand can be met. This will reduce the market options for coal suppliers in China and contribute to further deterioration of the climate for necessary coal mining investments.

2.64 To address the shortage of electricity and the increasing demand for coal, the NDRC is devising a strategic plan that envisages 13 major centers of coal production or "coal bases" with eight large coal mining groups producing most of the output by 2005. According to some reports, over 100 new mines are being planned that will be funded by combinations of national debt through the state banks (noncommercial, low-interest loans), domestic JVs with steel, power, and chemical companies and private finance. Additional government investment in expansion of the rail network to ease coal transport

and other infrastructure development is also envisaged. The government financing of mining projects is likely to conflict with China's fiscal and banking sector policies, undermine the creation of a level playing field, and perpetuate past sector inefficiencies.

2.65 A further aggravation is the uncertain status of national coal reserves. Though China claims its coal reserves are in excess of 114 billion tons, the figure is not an aggregate of classified mine reserves that takes into account the economic viability of extracting the coal and does not reflect the true availability of coal reserves for investment. Reserve estimates for a mine usually include all potentially workable seams to ensure that the mine life criterion in the code for mine design can be met. For example, a mine with a production capacity of 0.45–0.90 Mtpa should have a life of at least 50 years and achieve a specified coal recovery (for example, 85 percent for thin coal seams) to obtain approval for a coal mine project. The concept of reserves being coal that is economically viable to mine had little meaning during the planned economy period, and is still widely misused. According to domestic experts, there is a general shortage of coal exploration throughout China and concern about inadequate reserves available for new coal mines. This is partly due to the large volumes of coal tied to existing leases, some to coal mining enterprises that do not have the financial standing to develop them. Foreign investors will seek to reinterpret geological data and classify reserves in accordance with recognized international methods as part of a due-diligence study, and therefore any shortcomings in existing Chinese reserve classifications may not be a major issue when evaluating a specific project. However, reliable, classified coal reserve estimates obtained using internationally accepted methods are urgently needed if the government is to formulate the necessary strategies and policy to develop a sustainable coal mining sector that will meet China's energy needs.

2.66 In adhering to its mine closure policy, the government does not have the option to increase output from small mines, so substantial investment in expanding the capacity of existing mines and constructing new industrial-scale coal mines is necessary. Initially, much of the increased output will be from reserves already allocated to the state-owned mining enterprises. The expansion in capacity must be matched by more intensive and rigorous exploration to identify high-grade replacement reserves suitable for efficient, mechanized mining. Increased reliance on open markets to balance coal supply and demand will encourage massive investments needed to upgrade existing large mines, replace small mine capacity with large mine capacity, replace exhausted or inefficient capacity, and construct new mines.

3

Investment in Coal Mining

Investment Needs

3.1 Investment is needed to modernize existing large coal mines in China and reduce staffing levels, reduce the number of workers exposed to risk, increase productivity, reduce overall operating costs, and improve safety. However, KSCOMs are not likely to attract foreign investors because of the potential health, environmental, and residual social liabilities that reduce their ability to compete on equal terms with new mines that do not carry these burdens and also with the international coal market. Additional reasons why most KSOCMs are not attractive to foreign private investors are that modern mining systems may be difficult to retrofit to existing underground infrastructure, and the attitudes and work practices of management and workers are difficult to change. The progressive mines of Shenhua and Yankuang Groups are exceptions. The more likely trend of investment in existing mines will be acquisitions, by financially sound Chinese coal enterprises, of failing coal mines that hold commercial coal reserves.

3.2 An estimated US\$11 billion of investment would be needed to replace the capacity of TVCMs if all were closed at supposed current levels of coal production, and US\$18 billion if small SOCMs were also included. This would imply a virtual doubling of the large mine capacity and a reduction in the total number of coal mines from about 30,000 to some 800 (assuming an average output of 2 Mtpa). Some of the production deficit resulting from small mine closures is currently being offset by raised production at remaining mines, but ultimately mining capacity needs to be replaced as small mine closures continue. Some of the replacement capacity would be in existing mining areas already allocated to large mining enterprises, some in newly explored areas, and a proportion from small mines that have been transformed and consolidated into large efficient mines. Funding could be provided as equity by sound mining companies complemented with funds from domestic sources such as the stock market, banks, and business consortia. Domestic investment is evidently available for sound project proposals. For example, six mining projects in Shanxi, Shandong, and Anhui Provinces are planned with a total estimated investment requirement of US\$900 million for a combined production capacity of 21 Mt. The investment costs per ton capacity range from about US\$24 to US\$60.

3.3 Substantially larger investment will be needed in new capacity to meet annually increasing demand for coal and replacement of exhausted mines. The International Energy Agency predicts China will have to produce 2.3 billion tons of coal by the year 2030 to meet its expected growth in primary energy demand, with an investment of US\$121 billion in coal mines from 2001 to 2030. Unless the government implements reforms to attract foreign capital to the energy sector, China's current economic growth will not be sustainable.

Domestic and Foreign Investment in the Coal Sector

3.4 A number of factors support the view that a more competitive coal industry is developing in China; consequently, greater investor participation is expected. These changes include the restructuring of state agencies dealing with coal, and the withdrawal of the state from its role as a coal mine operator and its shift toward a more administrative role of enforcing laws and regulations that will improve health and safety, environmental quality, reduce illegal mining, and reduce other barriers to investment. While most investment in China's coal mines is expected to continue coming from domestic coal enterprises, several major coal mine developments through foreign JVs and cooperative agreements could occur over the next 15 years, if reforms are accelerated and barriers to investment removed.

Domestic Funding for New Coal Mine Projects

3.5 To date, about 99 percent of all investments in Chinese coal mine developments have come from domestic sources. The financing of state-owned coal mines, mainly KSOCMs, has evolved through:

- appropriation from the state budget during 1949–85
- state loans, construction bank loans, and soft loans from international funding agencies during 1985–94
- state development bank loans with preferential terms during 1994–99
- state development bank loans with no preferential treatment since 1999.

3.6 Concerns about coal shortages and a wish not to repeat the uncontrolled escalation of small mining operations has led the government to consider reintroducing preferential loans for mine construction by large-scale coal enterprises, despite conflicts with its own banking policies.

3.7 China's banking sector reforms require banks to operate in a commercial environment taking due account of risk in line with international practice and WTO rules. Given credit limits and risk spreading, the banks will be unable to satisfy all the borrowing requirements of the coal mining sector. The coal sector owes some 70 billion

Yuan to state banks. Many coal companies find it difficult to obtain bank loans due to poor past financial performances. Only a few coal companies such as Shenhua (Inner Mongolia) and Yankuang (Shandong) Groups have earned a high credit rating. Domestic observers have remarked that the latter two companies are able to raise loans even for marginal projects. According to state regulations, the equity of a new mine should not be less than 35 percent of the total capital cost. Presently, few mining enterprises are able to meet this requirement. While it may be possible for some township collective and private coal mines to raise equity capital from collective and private sources, as is already happening, the bulk of the investment is still likely to come from large companies with mixed state and private ownership.

3.8 It is expected that major Chinese coal enterprises will continue to become more competitive in the future, and more active in investments across China and possibly also overseas, if the sector reforms are deepened and accelerated. The withdrawal of state government subsidies from ailing coal mines and the closing of unprofitable mines have been and remain important factors in accelerating reforms toward a more competitive coal industry. Policies to use competitive bidding for allocating known coal resources and open new areas for exploration on a first-come, first-served basis should also improve the competitive investment environment. Closing illegal mines and stopping illegal mining into the reserves of legal mines should further improve the investment environment and reduce supplies of cheap coal from illegal activities, though some potential investors doubt how effectively this can be policed.

Foreign Investment in Coal Mining in China

3.9 Most foreign assistance for China's coal sector has been in the form of multilateral loans and grants from international aid institutions, bilateral loans and grants from individual countries, and trade projects. By the end of 1998, the total use of foreign funds in China's coal sector reached US\$5.0 billion, of which 69 percent (US\$3.5 billion) was for equipment and technology. Governmental loans are dominated by the Japanese Energy Loan Program, which has provided a total of US\$3.8 billion, mainly for the construction of coal preparation plants and coal mines. Japan has also provided assistance for the recovery and use of coal mine methane. The World Bank provided a US\$79.5 million loan to develop the Changcun mine in Lu'an mining area, which also received additional assistance from UNDP and Germany. A Global Environment Facility (GEF)-UNDP grant of US\$10 million was used for coalbed methane projects in Songzao, Kailuan, and Tiefa mining areas. Compensation trade projects include French export credits to construct the Dongtan mine in Yankuang mining area, a contract with the Romanian government for the Bailong and Caocun mines in Huoxian mining area, and cooperation with Germany on the Yuanbaoshan surface mine.

3.10 International companies involved in China's coal sector include Asian American Coal (JV Daning coal mine), Anglo American, BHP-Billiton, RAG, and Rio Tinto (evaluating coal mine opportunities), and Arco, Phillips Petroleum, and Texaco (evaluating coalbed methane opportunities). In more than two decades of open-door policies for foreign investments, only two coal mines have been developed by foreign

investors, one a surface mine, Antaibo, and the other an underground mine, Daning. Both are in Shanxi Province.

3.11 Antaibo surface mine. The 15-Mtpa Antaibo surface mine, in Pingsu mining area, was jointly funded by the former China National Coal Corporation (49 percent) and Occidental Petroleum (51 percent) of the United States. The mine started commercial production in 1987 but Occidental Petroleum withdrew from the project in 1991. The primary reasons for this were a strategic shift away from coal after the death of the Chairman, Dr. Armand Hammer, and falling coal prices in the 1980s. Currently, the surface mine is owned by the Pingsu Coal Company under the China National Coal Energy Group. There is apparently an unresolved dispute as to whether the state bank or the coal mining group owns the assets but this is not hindering coal production. The withdrawal of Occidental Petroleum from the Antaibao JV contributed to a lasting negative image among foreign companies of China as a place to invest in coal mine developments.

3.12 Daning underground mine. There is only one active foreign-Sino coal mining JV in China at present, the Daning coal mine project. The Daning coal mine is located in the Jincheng mining area in Shanxi Province. This project is being developed with the following equity participation: 56 percent Asian American Coal Inc., 36 percent Jincheng Daning Coal Co., Ltd., and 8 percent Shanxi Coal Transport and Sales Co. In September 2003, Banpu Plc (BANPU) announced that its wholly owned subsidiary BP Overseas Development Co. will buy an approximately 19 percent stake worth some US\$13 million in Asian American Coal (AACI).

3.13 Daning mine is operated by the Shanxi Asian American-Daning Energy Company. It has about 24 Mt of proven reserves of anthracite and 55 Mt of probable reserves. The mine uses modern western technology and equipment and is being operated and managed to western standards. Current production is by continuous miner but a longwall is planned to achieve the design capacity of 4 Mtpa. The total investment cost is US\$75 million. The customers are fertilizer plants (50 percent), power plants (38 percent), and steel plants (12 percent). The mine is not encumbered with the social infrastructure associated with KSOCMs. Safe production requires the worked seam to be drained of gas ahead of mining. Australian drilling contractors have been employed to install long degassing boreholes to ensure coal production targets can be met. Revenue from utilization of the drained gas will partially offset, perhaps by 50 percent, the additional costs incurred as a result of gas emission control.

3.14 Although not typical of investment and development strategies of the major international coal companies, AACI has demonstrated that foreigners can enter the coal mining business in China and navigate the legal procedures and bureaucratic steps. AACI began commercial negotiations on the Daning project with the Jincheng government in 1998. The process took two years before the joint enterprise was formed in May 2000. The procedures needed to investigate and approve the project involved some 30 steps and were completed in a relatively short period of time. The mine commenced coal production in October 2002. The provincial planning commission approved the project

but the policy mechanism invoked is not consistent with the interpretation of central government. Delay by the government in resolving this procedural issue is another disincentive to foreign investment.

Barriers to Investment

3.15 To obtain the most current and accurate information on barriers to foreign investment in coal mining in China, we interviewed representatives of international mining companies and experts with practical experience of potential coal mine developments in China over the past decade. While there were broad similarities in investor concerns, there were differences that reflected the levels of experience in China and company investment objectives.

3.16 Foreign investor strategy depends on a number of factors some of which are outside the direct control of the GoC, such as international coal prices and the fact that due to global consolidation there are relatively few competing major international coal mining companies. Of relevance to China are the following barriers to investment that can be reduced through government action and negotiations:

- **Enforcement of safety and health and environmental regulations.** The poor safety record of Chinese mining operations is cited by one company as a serious deterrent to investment. It was also suggested that strict enforcement of safety and health regulations in mining and environmental regulations for coal consumers (particularly coal-fired power plants) would be a great help in leveling the playing field within the coal industry of China, ensuring that all costs are internalized by all participants and substantially improving the investment environment for coal mining companies.
- **Illegal mining.** Investors are highly supportive of GoC's action to reduce illegal mining activities. Some investors are skeptical of the effectiveness of government measures to detect and terminate operations at illegal sites, and in particular of the protection of licensed resources from degradation by these illegal activities. Remote sensing, photogrammetry, and geophysical techniques have been suggested as necessary aids to address the problems. In addition to the enforcement issue, the problem of illegal mining is also the result of poor management by individuals and companies that hold limited or no rights to the land and resources. Movement toward a system where individuals and companies hold clear and enforceable titles to land and resources would reduce the problems of misuse of land and resources, reduce enforcement costs of government, and enhance foreign investor interest in coal mining in China.

- **Management control.** Management control of mines is a high priority for most foreign investors. Companies are quite prepared to have Chinese partners, but are not prepared to give up management control of coal mine projects. Part of the concern is that the objectives of Chinese partners may be different, and this could adversely impact the overall success of JV mining operations. Foreign investors were generally quite interested in having Chinese JV partners as minority shareholders.
- **Availability of coal reserves.** Foreign mining companies report that there are limited “available” large blocks of high-quality coal reserves that are suitable for commercial development on a large scale. Most available reserves are only suitable for underground mining—an added safety concern for foreign investors. All respondents indicated that the reserves of highest interest to foreign companies are far inland in Shanxi and Inner Mongolia, and this increases the difficulty of developing profitable projects for the export market. The Shenhua Group is viewed with some envy by foreign investors, as they have access to the size and quality of reserves that foreign companies are seeking. A concern of foreign companies is that favored domestic companies will continue to receive preferential treatment and access to the best coal resources. Preferential treatment by the government of selected domestic firms is viewed as a deterrent to achieving a level playing field that is attractive to foreign investment.
- **Difficulties of data acquisition.** The initial stage of investigation for commercial coal deposits entails the collection of extensive amounts of reliable geological and geophysical data. Foreign companies report that the necessary data are not readily available at reasonable prices in China. There is no central repository for geological and cadastral information. Improving data availability would facilitate more active and successful foreign (and probably domestic) company participation in China’s coal sector. Although foreign investors are not explicitly precluded from exploring for new reserves, there is some evidence that eastern provincial governments are citing the State’s “Guidance to Foreign Investment in China” (April 1, 2002) as justification for rejecting applications. This document allows limitations to be set for investments involving special and rare coals but the terms are not clearly defined.
- **Sales and export controls.** Lack of long-term sales contracts in China is a concern for developers of large mines and increases the difficulties in obtaining project financing, though there is a general

view that acceptable arrangements can be negotiated at the time of development of a major mine. Four Chinese companies authorized by the state monopolize coal export. Foreign companies are concerned about ensured access to export markets, particularly where flexibility is needed to meet rapidly changing marketing opportunities.

- **Bureaucratic delays.** One concern is uncertainty in determining which agencies are responsible for decisions on applications, with confusion between provincial and central government authority. Unnecessary delays and uncertainty occur in the decision process, which lacks adequate transparency. Companies need to closely monitor the progress of their applications through the approval steps to ensure that their applications do not become stalled.

3.17 We also identified additional barriers of less concern to foreign investors. These barriers were generally believed to be manageable as part of normal business activities in China and include:

- **Mine design and operation.** Companies with specific knowledge about mine design requirements in China indicated that mine design and operation requirements, equipment selection, and operating procedures are not fully compatible with modern international practices, resulting in higher construction costs for coal mines and costs to modify imported mining equipment. These problems can be reduced through changes in regulations, negotiations, and working with appropriate Chinese counterparts.
- **Disagreements over JV partner contributions.** This is not unique to China and is a matter that companies believe they can resolve through negotiations with their partners. Basically, the foreign investors believe that the Chinese partners place too high a value on their contribution to JVs, while Chinese JV partners often believe the foreign company's project cost estimates are too high due to insistence on imported equipment. Respondents noted that the Chinese nevertheless recognize the value of imported equipment, as they have been actively importing foreign mining equipment for two decades.
- **Lack of specific laws and regulations on foreign investment in coal mines.** China has special regulations for foreign investment in oil and natural gas projects in China, such as production sharing contracts, but there are no similar provisions for coal projects. The issue of enforcement of a company's rights is a particular concern, particularly over a mining lease area.

- **Technology culture.** Most potential foreign investors believe they can manage the establishment of a new mining project much easier than investing in an existing coal mine where Chinese management and operating practices will be more difficult to change.
- **Social fabric.** The phenomenon of the enterprise, or *danwei*, providing the full social fabric for the workforce at a new mine is not acceptable to foreign (or domestic) companies in a competitive market. Foreign companies prefer to pay miners higher wages and provide less of the social infrastructure and services common to Chinese KSOCMs.
- **Recruitment.** High-level management and technical staff are difficult to recruit, motivate, and retain. Coal mining is not attractive to graduates because of the remoteness of many sites, the poor social standing of mining-related jobs, poor working conditions, and low salaries. This is an important issue for domestic and foreign mining operations, the commercial success of which requires a high standard of management.

Incentives and Factors Impacting the Investment Climate

3.18 The central government offers certain tax exemptions, mainly to foreign investors, as an incentive for investments in the coal sector. Some of the major incentives, such as reduced initial income taxes, VAT, and import tariff exemptions, are applicable to all foreign investment and not only to the coal sector. In addition, further exemptions are granted for specific mining projects, such as for development of mineral resources in western provinces, coalbed methane (CBM) exploration and development, and production of building materials with coal waste and fly ash. The main features of these incentives are summarized in annex 1.

3.19 Present GoC policy is to encourage cross-sector financing and development of coal mining, coal chemical, and power generation activities. Coal-producing provinces are therefore seeking value-added economic activity, not just raw coal production. Integrated projects are welcomed because of the job creation and community economic benefits. An investor who is willing to go downstream may have a better chance of acquiring approvals and mining rights. Guizhou Province, for instance, has a policy of fostering cross-investment between mines and power plants. This may help dispel natural conflict between the two sectors and accelerate project development in the short term, but may result in unwieldy JVs between multiple parties.

Power Sector Reform and Development

3.20 The strong reliance of the power sector on coal supply means that any changes in the structure of the power sector impact the coal market. Reform of the power sector is well advanced. On December 29, 2002, five power generation companies, two power grid companies, and four ancillary companies were formed from the State Power Corporation.

The aim is to provide competition within the power sector and separate generation from distribution. A State Power Regulatory Commission will protect the public interest and oversee environmental protection and the national energy strategy. In addition, China has formulated an ambitious strategy to transmit power generated in western provinces with rich coal sources and areas with good hydroelectric resources, to the energy-hungry cities of eastern China. This “west-to-east” electricity scheme will open up new opportunities in remote areas for investment in mine-mouth power schemes and will assist the economic development of the western regions. A particular attraction will be the elimination of rail transport costs and a reduction in demand for rail transport capacity.

3.21 Coal accounts for about 60 percent of the power generation costs; therefore, the coal price and generation costs are closely linked. The following trends are expected to emerge:

- Construction of new coal-fired power plants closer to mines in order to reduce transport costs of coal.
- Power enterprises developing mine-mouth power plants at long distances from their electricity markets. Power enterprises want the added security of owning the mines at their mine-mouth power plants.
- Coal mining enterprises under greater pressure to increase efficiency, reduce coal production costs, and improve coal quality to meet environmental standards.

3.22 International concerns about the sanctity of power purchase agreements will discourage independent power producers from entering the market, and therefore coal production and power generation will be mainly domestically financed and operated by large state-owned conglomerates.

Rail Transport

3.23 The primary means of coal transportation by rail accounts for more than 40 percent of the total rail freight transport in China. Limited rail capacity is an important factor that impedes investments in coal mining enterprises. A combination of factors worries investors, including:

- typically, long (800–1200 km) transportation distances to ports for coal exports
- uncertainty about annual rail capacity allocations
- uncertainty about the flexibility of the rail transport system to allow the company to respond to rapid changes in market conditions
- total transport costs that can account for more than half of the delivered costs of most of Chinese coal exports.

3.24 China's transportation cost-calculating standards are stipulated in the Rail Freight Rate Regulations. Basically, a fixed cost (Yuan/ton) is determined according to the contents of the freight and the mode of transportation, plus a measured rate dependent on the distance traveled (Yuan/ton/kilometer). In addition, collection of additional rates for the use of an electrified railway or a newly laid railway, and the raising of a railway construction fund are permitted. Any levy not ratified by the State Council is prohibited but local railway departments have been reported to collect additional fees under various guises. The railway authority must approve any private track, for example from a mine that connects to the national system. The central planning approach to rail traffic of coal has been to allocate transportation quotas. Out of the 700 Mt of coal transported by the state railways in 2001, 390 Mt were allocated through the annual coal fair organized by the NDRC. Until very recently, approximately 60 percent of the production of KSOCMs was sold through contracts concluded at the annual coal fair. A new mine would have to participate in the conference and submit applications to the Ministry of Railways and the Ministry of Communications to obtain a railway transportation quota. In addition to the conference allocated quota, there is a free quota of approximately 300 Mt, but it is uncertain how this is allocated. It appears that the Ministry of Railways makes the final decision in the case of long-range transportation passing through several railway bureau jurisdictions. Apparently, the local railways bureaus (railway branch bureaus) can exercise discretion in allocating railway transportation quota, which means there is considerable scope for corruption. The GoC needs to take steps to abolish the quota allocation system and to take measures to introduce market mechanisms.

3.25 The concept of moving options assessment upstream means that dam and non-dam options should be considered as part of a strategic planning process, which should be undertaken before a specific project is considered. It may well emerge that there are good alternatives to meeting the needs, apart from developing dams.

Coalbed Methane Recovery and Utilization

3.26 CBM and coal mine methane (CMM) utilization can offset some of the additional costs of gas control for safety reasons when developing gassy coal mines. There has been substantial interest in virgin CBM exploration (independently of mining) in recent years by international oil and gas companies that believe there may be large potential in China and that are attracted to the favorable terms and conditions for foreign participation. However, no significant commercial production has been achieved to date. In contrast, more than 500 million m³ of CMM captured in working mines is being used annually but this only represents about 12 percent of the gas potentially available for capture in China's coal mines. The large domestic mining groups are showing interest in the CMM market, and this is being encouraged by the GoC for environmental and clean energy reasons. The World Bank, Asian Development Bank, the International Finance Corporation, the Dutch Government, the Danish Government, and others have established carbon funds based on Kyoto Protocol mechanisms that may be able to assist the financing of CMM utilization projects. CMM projects in China that can demonstrate

significant methane emission reductions may be eligible for support from the Clean Development Mechanism or the World Bank's Prototype Carbon Fund.

4

International Comparison

Perspectives

4.1 For the purposes of comparison with China, Australia and the United States were selected as prime examples of market economies with coal mining legislation and administration that support a strong and well-managed domestic and overseas-financed coal mining industry. Australia has been particularly successful in attracting foreign investment and represents a good model for China to examine in depth. These countries have thriving export markets. The coal production and export performances of these countries are compared in table 4.1.

Table 4.1. Coal Production and Exports for China, Australia and the United States, 2002

<i>Country</i>	<i>Coal Production (in million tons)</i>	<i>Exports (in million tons)</i>
China	1,326	86
Australia	276	198
United States	917	35

4.2 The United Kingdom and Japan were selected because of their experience in coal sector rationalization including coal mine closure policies and planning and management of social and environmental issues during contraction of their coal mining industries. Solutions for dealing with postclosure liabilities may be particularly relevant.

4.3 Australia, Japan, the United Kingdom, and the United States have developed sophisticated health and safety legislation along with practical guidance and procedures to ensure that safe working practices are employed in coal mines of all sizes and complexity. China's coal mining industry can benefit from their experiences.

Technological Background

4.4 An understanding of the role technology has to play in coal mining helps to explain some of the differences between China as a coal mining country and other major coal-producing countries.

4.5 **Underground mining.** The most productive underground mines generally exhibit common favorable factors—drift entries rather than shafts, shallow, thick coal seams, simple geological structure, and low gas emissions. Examples of these can be found in Australia, China, and the United States. These are the targets that are most attractive to investment, as the technical risks are low and most suited to the efficient use of high-production, modern longwall equipment.

4.6 Productivity in Shenhua Group's most advanced mines attains world standards and is 33 times higher than the average of all the other KSOCMs. However, productivity in most other Chinese coal mines ranges from 100 to 1,250 ton/manyear, which compares poorly with the private sector coal mining industry in Australia and the United States, where productivity is 7,600 ton/manyear and 10,600 ton/manyear, respectively. China's low productivity reduces its comparative advantages of cheap labor. In countries with a history of nationalized coal production or heavy subsidies, productivity is generally lower. Mines in many of these countries have exhausted the most favorable geological reserves and miners are now working in difficult conditions, while government support is being maintained for strategic energy supply, political, and social reasons. In China, low overall productivity is partly also due to the fact that only about half the longwall operations in the KSOCMs are mechanized (coal faces mined by longwall methods account for 96 percent of total output of KSOCMs).

4.7 Equipment for a longwall top coal caving method has been developed in China, appropriate for mining thick seams. Although widely used in China, the comparative countries prefer to use conventional full-seam height cutting methods. No major western mining equipment manufacturer has elected to produce top coal caving equipment. There is considerable debate about the relative merits of Chinese and western longwall equipment, although some Chinese engineers believe the robust foreign equipment to be more reliable and that the high availability outweighs the higher cost. For these reasons, a foreign investor is likely to import western longwall equipment. Over time, the differences in productivity and reliability between Chinese and imported equipment are likely to decrease.

4.8 **Opencast mining.** In Australia and the United States, opencast mining accounts for about two-thirds of production. In 1999, China had over 70 opencast mines with a total annual production capacity of 52.4 Mt, consisting mainly of lignite and constituting only 3.3 percent of the total raw coal output. The best 15 opencast KSOCMs have a combined annual production capacity of 40.8 Mt, an output of 30.8 Mt, and an average stripping ratio of 4.3. During the 1996–2000 period, the construction of opencast mines in China reached 28 Mtpa, accounting for 25 percent of KSOCMs under construction. According to Chinese experts, the annual output of opencast mines in China will increase to 150 Mt by 2010.

4.9 Opencast coal mining can be substantially less costly and is much safer than underground mining, but it has a large impact on the surface environment and requires extensive reclamation before returning the land to agricultural use. Opencast mines have a much smaller workforce than underground mines, but can make a greater impact on the

environmental quality of nearby communities if not planned, managed, and regulated to high standards. Land-use policies, lease conditions, reclamation standards, security bonds, and monitoring procedures are used in Australia, the United Kingdom, and the United States to ensure adequate protection of the environment. As most of China's coal resources are deeply buried, China is expected to continue to rely heavily on underground mining.

Coal Mining Sector Administration

4.10 Comparison of the institutional and legislative framework underpinning various aspects of the coal sector in the selected example countries with China helps to identify possible solutions for deficiencies in the current systems in China. It is not suggested that China adopt investment policies and legislation identical to those of any other country but instead that it evaluates and adapts successful approaches in the context of China's political and economic situation. While there are imperfections in all organizational frameworks considered here, the most appropriate policy and regulatory models in other countries that warrant examination by the GoC to assist in planning its reform program are summarized below. Annex 3 provides a comparison in addition to detailed features and background information regarding coal mining administrations in the compared countries.

4.11 Institutional management of the coal mining sector in the comparative countries is aimed at allowing competitive, socially acceptable mining operations while guarding the safety of the workers and protecting the environment from unacceptable damage. Coal mining in these countries is financed and operated by the private sector, although in some instances there has been state intervention to promote expansion or maintain energy diversity for strategic reasons.

4.12 The main features of the foreign coal sector administration frameworks are:

- three or less tiers of management
- fewer ministries and agencies involved
- minimal government interference with coal mine operations
- health and safety management strictly enforced and independent of coal production
- environmental agencies with consultative and enforcement roles at all levels
- associations of coal producers and other coal industry interest groups, such as miners' unions and environmental groups, assist government to understand industry needs and capabilities in developing policies and regulations.

4.13 The United States exercises its administrative functions over the coal mining sector at the federal and state level, equivalent to the state and provincial level in China.

Australia has a similar structure including a level of local offices equivalent to the prefecture and county levels in China. In the United Kingdom, the Department of Trade and Industry provides the equivalent of the federal role. Strategy is planned on a two-year cycle within a National Energy Plan by the U.S. Department of Energy, in comparison with China's five-year coal industry plans formulated at the state level. Strategic planning is also a federal function in Australia. The key regulatory functions in the United States and Australia are performed at the equivalent of the provincial level in China.

4.14 The four countries reviewed attach high importance to industrial health and safety, and formulate policy at the federal level with specialist mining experts within the national health and safety management framework. However, there are differences in the structure. The U.S. Mine Safety Health Administration is attached to the Department of Labor, whereas in China the State Administration of Coal Mine Safety is part of the State Administration of Work Safety. Health and safety policy in the United Kingdom is determined by a Health and Safety Commission, an independent government agency, and implemented by a Health and Safety Executive of which the Inspectorate of Mines forms a part.

4.15 Environmental protection regulation in all the countries is the responsibility of a specialist agency with lateral links to coal mining sector management. Land-use planning is predominantly concentrated at the equivalent of provincial government in most countries, with policy formulated at the federal level.

Coal Resource Administration

4.16 The United States has a dual system of coal ownership, with both privately owned coal rights and federal government-owned rights. Leasing of federal lands by a bidding system ensures that the state receives a fair market price for federally owned resources. The market price is determined through bidding, with a minimum acceptable bid determined by the government's estimate of the market value of the resource being leased.

4.17 Coal in Australia and the United Kingdom is owned by the Crown with resource management entrusted to Australian state/territory governments and the U.K. Coal Authority, respectively. In Australia a royalty payment prescribed in the legislation is exacted per ton of coal mined in exchange for the transfer of rights to extract coal. An additional royalty is payable on some opencast coals. Australia's continued success in attracting foreign capital to coal mining ventures demonstrates that Australia's policies and legislation are attractive to foreign investors. The royalty-type payment required in exchange for coal extraction rights is simple and effective and could replace the more complex mineral resources compensation fee applied in China.

4.18 Both Australia and the United States provide useful examples of countries that release, at nominal cost, extensive amounts of high-quality geological, geophysical, and other technical information that is widely used by domestic and foreign companies in exploration.

Approval Procedures for Coal Mine Exploration and Development

4.19 Coal mining projects are heavily regulated in all four compared countries. A mine project in the United States may take as long as 10 years to progress from concept to start of production. Surface mining is particularly demanding in terms of construction and reclamation commitments.

4.20 Australia provides rapid and effective licensing and leasing services to the coal mining sector from state-level organizations, equivalent to the provincial level in China. The Resources Planning and Development office of the New South Wales State (provincial equivalent) government in Australia demonstrates high efficiency in approvals procedures, aiming to process more than 85 percent of all exploration license applications within 10 weeks of submission and to grant more than 90 percent of mining leases within two months of obtaining development consent. Exploration licenses are renewable and granted for periods of up to five years. To deter speculative leasing, a commitment must be made to spend a certain sum on exploration. An assessment lease can be applied for to bridge the gap between exploration and mining leases. Mining leases are renewable and are granted for up to 21 years. A security deposit is required to ensure restoration after cessation of mining. All projects, regardless of size, are managed at the state (equal to province) level.

Safety and Health

4.21 Health and safety issues have long been of primary concern to the coal industry. Major international coal companies value their image as globally responsible citizens both with regard to protecting human life and the environment. The advances in mining technology, safety legislation, and enforcement during the past century have in combination led to simultaneous improvements in both productivity and safety in the developed countries. Modern coal mining can achieve health and safety standards higher than in many other industries. For example, the U.S. Bureau of Labor statistics show that injuries are more likely in the timber, construction, farming, and furniture industries than in coal mining. While all of the countries have effective mine safety and health management systems, the United Kingdom with its history of regulating a nationalized and then a denationalized coal industry, and Australia with its success in managing a private domestic and foreign-funded coal mining industry have features of relevance to China.

4.22 Fundamental is the assigning of safety responsibilities to all individuals within a mining company and placing the onus on mine managers to maintain safe working environments. Safety management places responsibility on mine management to assess hazards and risks for all mining operations and implement safe work practices. In addition, everyone in the mining organization including the owner, the chief executive, and through to the workers have defined responsibilities. Miners receive regular job-skill and safety training, and coal companies recognize that training prevents accidents and that improved productivity and improved safety are closely linked. A highly experienced and independent mines inspectorate works with the mining companies to help them

improve their safety performance and use their legal enforcement powers when necessary. The safety regulating agency's inspectors are trained, well-paid professionals with senior management experience in coal mines. The United Kingdom and United States legislate specific mine safety laws and regulations at the federal level, Australia at the state/territory level.

4.23 The total cost of accidents in Chinese coal mines is substantial because of lost production, damaged tools and equipment, compensation, loss of workers, overtime, investigation time, legal costs, and penalties. The chronic diseases that afflict coal miners can take many years to develop to a critical stage. Given the many workers at risk in China, a substantial financial liability will be attached to existing coal mining enterprises that either the company, or the government, may face in the future. Examples, well known in the United Kingdom, are the costly respiratory diseases claims recently awarded against British Coal. Direct foreign investments in coal mines and foreign technical assistance can be effective in introducing safe mining practices that have proved to be effective in other countries.

Environmental Protection

4.24 The four countries reviewed have developed extensive environmental protection legislation. In contrast to China, it is effectively enforced in the coal mining sector.

4.25 Key ingredients of coal sector administrations in other countries are specific environmental laws enforced at the state (provincial equivalent) level, consistent enforcement of laws and regulations, and security deposits to ensure reclamation of mining areas. Mining operators in the United States pay a fee per ton of coal mined into an Abandoned Mine Reclamation Fund, which helps finance restoration of historical damages. The New South Wales government (provincial government equivalent) in Australia requires a Mining Operations Plan and an Annual Environmental Management Report as a lease condition. A license is also needed from the Environment Protection Authority for mining. In all comparative countries environmental protection legislation is strictly enforced. China needs to strengthen its environmental legislation in the mining sector but, more importantly, ensure existing legislation is rigorously enforced on all mines regardless of size or ownership.

4.26 The environment agencies in Japan and the United Kingdom also have important roles in monitoring and managing the long-term effects of mine closure, particularly with regard to mine water recovery and surface instability in areas of shallow mining. In the United Kingdom, the Coal Authority is responsible for responding to environmental problems associated with abandoned mines. In China, MOLAR is responsible for the land rehabilitation, but there is no national policy with respect to environmental damage associated with abandoned mines.

Mine Closures

4.27 Both the United Kingdom and Japan have undertaken major coal mine closure programs to rationalize ailing industries that have suffered serious declines due to depletion of low-cost reserves. Planning in both countries included mitigation of social and economic impacts, as well as making provisions for the management of environmental liabilities following closure and abandonment of the mines. In the United Kingdom, there have been intensive large mine closures both before and after privatization of the British Coal Corporation. Japan has a long history of phasing out its coal mining industry with large subsidies to mitigate social problems caused by loss of employment. The issues that have influenced the policies of the U.K. and Japanese governments in planning systematic coal mine closures include the scale and speed of closures, costs, mitigating social impacts, and addressing postclosure environmental liabilities. Australia and the United States have had no specific policies on coal mine closures, since these countries have always relied on the use of market forces and private sector decisions to determine mine closures.

4.28 In the United Kingdom, coal mine closures were implemented after the withdrawal of government subsidy to the nationalized coal industry. Market pressures forced British Coal to close its inefficient mines, the number of closures increasing due to deteriorating coal prices. Coalfield area regeneration measures were planned and implemented by government both in Japan and the United Kingdom. Various schemes were introduced to seed development of new businesses and to retrain miners for alternative work. Closure of a small mine is a matter for the private owner to decide depending on mining reserves, production costs, and market conditions. Safety aspects of closure are monitored by the Mines Inspectorate; public safety and environmental protection is managed by the Coal Authority. A bond is usually held by the Coal Authority that is only relinquished after restoration conditions have been met. The Coal Authority was formed by the U.K. government following the privatization of British Coal. Its role is to manage coal resources, licensing, and the inherited liabilities of British Coal, in particular the long-term environmental impacts of mine closures.

4.29 In Japan, the government undertook programs to close all inefficient and unsafe coal mines. Japan did not differentiate between small and large mines in providing support. Mines were selected for closure solely on the basis of economic efficiency and safety of operations. Mine owners received compensation for their loss of rights when mines were bought out by government. As in the United Kingdom, various schemes were introduced to seed development of new businesses and to retrain redundant miners.

Promotion of Investment

4.30 Taxation in China is broadly comparable with other coal mining countries, and it is the general view of experts and investors that taxes do not represent a major barrier to coal mining investment in China. There are other important barriers for investment in

China, in particular for foreign direct investment. In this regard, the Australian model provides a sound example for the GoC to examine.

4.31 The Australian government welcomes foreign investment on which development of the Australian economy depends. Australia has a foreign direct investment policy and an advisory board that ensures that proposed projects are consistent with federal policy and protect Australia's interests. The ultimate aim, however, is to provide an environment that will attract responsible investors. Procedures for the acquisition of exploration and mining rights are streamlined and transparent. In the United States, foreign companies have actively invested in the coal mining sector by acquiring equity in existing coal mine companies, but there is no specific foreign investment law or specific advisory body on foreign investment. There are, however, some controls and monitoring procedures.

4.32 Both Australia and the United States have well-functioning coal markets and efficient coal transportation systems, whereas in China the system of coal sales and transportation still has visible characters of the planned economy and lacks transparency. In Australia and the United States, there are no specific policies on coal markets and sales other than to prohibit any state (provincial level) actions that impede the free passage of goods. This contrasts with the situation in some provinces in China where a fee is charged for the export of coal (for example, Shanxi Province). In Australia and the United States, market forces balance supply and demand. Producers and suppliers can reduce price risks by negotiating long-term contracts. For coal transport on rail, both the United States and Australia use large unit trains managed by railroad companies or competent government departments. To further lower railroad tariffs, the governments of both countries are implementing further reform. For example, in New South Wales, private companies are being encouraged to participate in the railway business.

5

Conclusions and Recommendations

5.1 The coal mining sector in China is still hampered by “command economy” thinking, policies, and administration and a major “rethinking” of its approach to sector development is required. Excessive government intervention is preventing market forces from emerging, reducing the commercial effectiveness of the large State-owned mining enterprises, and discouraging private investment. Nevertheless, the government of China is seeking to identify and implement reforms that will lead to a significantly restructured coal sector characterized by higher productivity, improved social conditions, enhanced health and safety standards, mitigation of historic environmental degradation, and achievement of high environmental standards for existing and future mining activities. The reforms will, with further strengthening, continue to reduce GoC’s role in the mining business and focus attention on enforcing mine safety, controlling the detrimental impact of mining on the environment, improving the investment climate, and attracting new investment.

5.2 China’s economic growth during the past decade was accompanied by a rapid increase in the number of small mines that have been able to operate without adequate controls or safety or environmental regulation. Local economies have grown to rely on these mines that for social and fiscal reasons tend to be protected by local government. Within the small-mine sector, differentiation should be made between approved mines, which operate within laws and regulations, and illegal operations, which impinge on coal reserves assigned to medium and large mines or new development blocks. Given the substantial capital investments required to achieve full compliance with current legislation, most small mines would not be economically viable. Only the best ones would be able to compete fairly in the market place by providing local coal supplies where transport makes use of coal from large mines uncompetitive. Observations indicate that at provincial, and even more so at lower government levels, market concepts are poorly understood and there is a need for education and capacity building if reforms are to be effectively implemented.

5.3 The key areas recommended for government action to advance the sector reforms are seen in enforcement of laws and regulations, rationalization of the coal sector, and improvement of the investment climate. Enforcement of laws and regulations would introduce a level playing field for operators and rigorously implement mine safety and

environmental protection. Coal sector rationalization would deal with the problems of illegal mining, overreliance on small-scale mining, and depleting or uneconomic mines in general. The investment climate would be improved by the preceding actions and would be further enhanced through better access to coal reserves, streamlined approval procedures, and other promotions. Specific findings and conclusions and related recommendations in the three mentioned areas are listed below. The comments made are based on the reviews and case studies undertaken.

Enforcement of Laws and Regulations

5.4 Major findings and conclusions are:

- To establish a sustainable, environmentally and socially responsible market-based coal sector that meets growing demand it is fundamental that all producers compete on equal terms. To achieve this, there must be strict adherence by all to the rule of law, in particular with regard to ensure safety and protect the environment.
- There are clearly shortcomings in the coal sector organizational structure. The organization is diffuse, and there are differences in interpretation of regulations in different departments at various levels.
- The case studies confirm that detailed environmental studies and plans are made for mining projects but there is insufficient emphasis on implementation and little or no enforcement. EPBs are overstretched because of their wide range of duties across all industrial sectors.
- There is inadequate respect for safety laws: lack of enforcement of coal mining rules, regulations, and policies; insufficient resources at all levels of the government to effectively monitor and report compliance; too lenient penalties for noncompliance; and partisan coal mine safety inspectors who are selected from the same local mining areas where they will supervise.
- The safety philosophy underpinning the legislative approach to coal mine safety in other countries needs to be understood and applied in China. KSOCMs accept national and local safety indices (fatalities per Mt of coal mined) as a target not to be exceeded and are satisfied provided they meet this criterion.
- Health protection of miners receives less emphasis and only limited data could be found during the case studies. Employees of the large mines are monitored for lung disease but those of small mines are not. Coal mining health statistics are compiled by the

MOH but health protection measures are the responsibility of the SACMS.

5.5 The recommendations are:

- More resources and greater authority should be provided to the relevant agencies to ensure enforcement of laws and regulations on closure of illegal mines, mine safety, and environmental protection. The likelihood of collusion and corruption of enforcement officials will be reduced by improved staff training and motivation, higher salaries, and accountability to a higher-level authority.
- The administration of the coal mining sector should be further streamlined with emphasis on strengthening authority at provincial level as occurs in other countries. The roles and responsibilities of the different agencies involved with coal administration issues should be clearly defined and overlaps eliminated.
- Health and safety and environmental legislation should be formulated in line with current international standards and practices and enforced by the central government to ensure consistent enforcement among provinces. Many enforcement activities can be delegated to the province level, provided adequate oversight authority is maintained at the central government level. An option is to recruit inspectors nationally, give them intensive training, and periodically rotate them to different mining areas.
- Penalties should be imposed for infringement on land and mining rights. Coal enterprises, which believe that illegal coal mining is occurring within the boundaries of their legal leases, should have effective recourse to halt such practices through a strong enforcement agency at the province or central government level.
- The EPB should take an active advisory role during preparation of the EIA for mining projects and the mine's environmental management plan. It should also monitor and enforce the agreed emissions and discharges and maintain close liaison with the mine's environmental protection department. Local officials and mine management should be held accountable for environmental management failures. This should include the sanction to halt coal production until serious environmental problems have been rectified.
- An independent, objective examination of the safety management philosophy, regulations, procedures, training, and enforcement

should be made to assist the SAWS to identify and address the key issues. All mines should be encouraged to consider official safety indices as a minimum to be bettered by application of best practical means rather than as a target not to be exceeded. The concept of best practicable means should be introduced into safety legislation to drive continuing improvement.

- As a short-term measure, a confidential reporting scheme that allows miners to express their concerns on safety issues could be introduced, but ultimately open constructive criticism should be encouraged in line with the requirements of risk assessment methodologies used in developed mining countries.
- A closer link should be established between MOH and SACMS to ensure relevant occupational health data are gathered from all mines and analyzed to enable the effectiveness of protection measures to be monitored and improved. Process managers should seek to ensure that:

Coal Sector Rationalization

5.6 Major findings and conclusions are:

- An important cause of the financial problems of state coal mines is the management system and thinking largely shaped by the previous planned economy approach. By attracting private investment to assist the modernization and rationalization of the coal sector, benefits will be gained from the risk management procedures used by the investors, which will increase the efficiency in use of capital, in turn improving performance of the coal sector. An inevitable by-product of this process will be the identification of mines with geological, market, coal quality, or mining problems that make them uneconomic and that should be closed. Since many mines have been in operation for about 50 years (including some over 100 years), the number of mines facing exhaustion of reserves is increasing. There is a clear need to implement plans to enable closure, regardless whether large or small mines, to be achieved as painlessly as possible.
- The GoC reports closure of 60,000 small coal mines since 1998. However, the limited available information suggests that many of these mines have reopened.
- Minimal consideration is given by local authorities to the environmental liabilities that could arise after the closure of small mines.

- Local governments are reluctant to close small mines until the fiscal impact can be offset by revenue from new sources. The problem is compounded by the need to protect employment. Plans for effective social and economic mitigation are the key to successful and permanent closure of small mines and hence the reduction of safety problems and environmental damage.
- Local governments do not have the resources, foresight, experience, or ability to plan for extensive small mine closures and mitigation of the social impact.

5.7

The recommendations are:

- Increased commercialization of the sector should be encouraged. This will involve the engagement of profit-oriented companies, the phasing out of subsidies, and transfer of transient social costs to the local government. There should be no noncommercial government financing for either new mines or improvement of existing mines. Investment funds should be provided by commercial industrial companies and raised through commercially operating banks.
- To foster economically sound, environmentally and socially sustainable mining, the following measures should be considered to rationalize inevitable mine closures: transfer of social assets and infrastructure to local government ownership; establishment of criteria and procedures for selecting mines for closure; preparation of a comprehensive legal framework to transfer liabilities and address social mitigation issues; establishment of engineering procedures to ensure safe abandonment with minimum future public safety and environmental liabilities; and appointment of one or more government agency or agencies to manage preclosure, closure, and postclosure measures.
- The policy recommended is to close mines that are operating illegally regardless of size or ownership. An inventory should be made of all mines and the status of their permits and compliance investigated. Any mine not meeting all health and safety laws and regulations should be subject to sufficiently high penalties to force compliance or closure.
- Policy and strategies should be formulated to ensure access to social and welfare support and to develop alternative employment opportunities. Without such policies, illegal, unsafe, and environmentally damaging mining will not be eradicated and redundant workers and their families will suffer deprivation.

- Financial support from the central government is needed at the local level for supervision of mine closure, postclosure policing (to ensure mines remain closed), site rehabilitation, ensuring safety of abandoned mine sites, compensation for mine owners (including local authorities), mitigation of social problems (including pensions and retraining), and promotion of economic opportunities.
- Capacity building is needed to increase the ability and effectiveness of local governments in planning for mine closure, economic diversification, and social mitigation. Institutional strengthening and capacity building of EPBs should be included.
- To form a basis for formulating future policy on the administration and financing of postclosure liabilities and technical guidance on mitigation, the environmental implications of small-scale mining should be urgently researched. The review should include gas emission, groundwater pollution, public hazards, and surface stability.

Improvement of the Investment Climate

5.8 Major *findings and conclusions* are:

- To improve the climate for investing large sums in mine and infrastructure developments, investors need a level playing field and clear, irrefutable title over a coal resource.
- Large volumes of coal are tied into existing leases and licenses, some to enterprises that do not have the financial standing to develop them.
- Data availability on the geology and quality of coal resources is inadequate and poses an important barrier to foreign investment.
- The approval process for large mining projects is long and uncertain in outcome. Many of the standards currently applied in China are outdated and a deterrent to modernization of the industry.
- Large state-owned mining groups often experience provincial government intervention in operation, management, and investment decisions.
- Consolidation of small local mines and transformation to large-scale mining could be promising in several locations but does not always find adequate support from local authorities.

5.9

The *recommendations* are:

- GoC should examine successful coal project agreements to determine which provisions reduce legal ambiguity. Conflicting laws should be modified to remove the conflicts. The GoC should avoid preferential treatment of mining groups and treat all investors equally in strict accordance with law.
- There should be a review of coal resources currently allocated to mining enterprises and an assessment of their ability to exploit them within, say, 25 years. Options to consider would be relinquishment of rights (probably with compensation) to the government, which would offer reserves to the market by bidding.
- For largely unexplored areas with limited competitive interest in bidding, the regulatory framework should provide for the issue of exploration licenses based on the first-come, first-served principle and an acceptable exploration commitment. Foreign investment in exploration should be positively encouraged. The availability and centralization of geological and mining rights information should be greatly increased. New geological findings of exploration activities should be submitted to a central repository where they can be held in confidence (say, for 5 years) to protect commercial interests, and then made available for public access.
- The GoC should streamline the mining project approvals procedures and implement performance standards for the administrators requiring completion of all steps within 12 months. The current prescriptive mine design standards should be replaced with guidance based on international best practice, where the responsibility for the suitability and safety of the design is placed on the mine developer. The evaluation process should be thorough with respect to health and safety and environmental issues, but flexible with respect to mine design and equipment selection. It should be fairly applied to all investors, irrespective of project size.
- The provincial government licensing role should be defined in detail and the production capacity criterion for referral of projects to state level removed to streamline the approvals process. Review and approval of coal mine and related investments of less than US\$100 million could be made at the province level. Australia's two-tier management (strategic at the central level, with most management functions at the local level) could provide an example.

- Government intervention in the operation and management of large state-owned mining groups through approval of projects, financing, and appointment of senior staff should be reduced and mining enterprises allowed to develop their business in accordance with commercial criteria.
- Policies should be developed that empower local governments to promote the identification and advertising of appropriate small mines suitable for consolidation and transformation.

5.10 These recommendations could be at the core of a twin-pronged strategic approach that aims to: (a) attract new investment, expand capacity and promote sustainable development and (b) support closure of obsolete, unsafe, and environmentally damaging mines in a way that largely preserves productive capacity and the revenue base of local government. Both aims support the overarching goal of securing the country's energy needs in an environmentally and socially responsible way. The main requirement in the case of new investment is probably the creation of a well-defined and observed level playing field for competent, commercially oriented companies; and in the case of effective closure of redundant capacity, is the provision of adequate support by the state for mitigating the social and environmental impact. Many of the detailed recommendations support both these strategic aims, with mutually reinforcing effect. Without a well-defined legal/regulatory environment with clear responsibilities and effective enforcement, progress is hardly possible, either in new investment or in mine closures. As a next step, the measures for an effective implementation of the twin-pronged approach should be prioritized as part of the continuing coal sector dialogue with the government.

Issues for Further Discussion

5.11 Domestic experts and international experts agree on some recommendations, but differ on others. The main issues where there are different perspectives are:

- **Ministry of Energy.** Some experts recommended the integration of the coal mining and investment approvals systems into a Ministry of Energy. This new organization would be responsible for strategic energy planning and macro-management of energy production and mix. A Department of Energy was established in 1988, but abolished in 1993 because of conflicts with parallel, independent ministries of coal, power, and oil. As the latter have all disappeared, there is a belief that an energy department could now fulfill its role satisfactorily. Other experts believe that a Ministry of Energy would create a new level of bureaucracy with the powers to interfere in energy production. This could reverse the useful policy actions already taken by the central government to reduce control and authority that are increasingly allowing

competitive market forces to shape the future of the coal sector. The proposed Ministry of Energy would also have the difficult task of integrating agencies responsible for oil and gas, coal, renewable energy, and probably nuclear energy. The strategic role envisaged for the ministry could be adequately undertaken by the NDRC's new Energy Bureau without the impediment of a new level of bureaucracy.

- **Special fund for new coal mines.** Some experts recommended the establishment of a special fund for the construction of new coal mines, administered by the proposed Ministry of Energy. This suggestion arose from their concerns regarding the ability of the financially stretched coal sector to fund replacement capacity and any required growth. The view of other experts was that coal mining enterprises should be required to obtain financing for coal mines in the same way that other industries obtain funds, principally through commercial banks, stock markets, and by entering into JVs with companies with the necessary financial resources. This latter view is consistent with the GoC's policy of moving toward a market economy. Similarly, the use of a special fund to assist construction of dedicated railways could cause market distortions. Railway tariffs should be set at levels that are sufficient to fund construction and maintenance of an efficient railway system.
- **Diversification of coal mining enterprises.** All the experts agree that government assistance is necessary in retraining redundant miners and associated people but some experts believe that a policy of encouraging diversification may not be efficient for various reasons. Many state coal mining companies are struggling financially and have limited funds to invest in establishing new business ventures, and transferring a comparative advantage in mining to unrelated industries is difficult. In Australia, the United States, and Europe energy companies that diversified into other sectors have had a high failure rate.
- **Promoting clean coal production.** All experts acknowledge the importance of clean coal and clean coal technologies for reducing the environmental impact of coal use. Some experts recommended legislation to promote production of clean coal and also the setting up of a Clean Production and Guidance Center that would provide training and consultancy services. However, these two recommendations are difficult to justify from a coal mining viewpoint in an emerging market economy where the customers' requirements and prevailing environmental legislation determine

coal qualities, and companies that fail to produce quality coal will have difficulty finding markets and will be seen as too risky to lending institutions. The problem in China is that without strict enforcement of health and safety and environmental laws, many consumers will buy the cheapest substandard quality coal. There was disagreement among experts over the potential merits of having special funds for new coal mines restricted to mines that produce clean coal. The case for such restrictions is not supported by international practices in Australia, Europe, and the United States where such decisions are left to the private sector. Some companies produce high-quality coal with little or no washing, while others need extensive coal preparation prior to marketing. The enforcement of sound environmental regulations encourages companies to introduce cleaner energy options, including cleaner coal and clean coal technologies.

Annex 1

Regulations and Documents Pertaining to Coal Mining in China

Administration of Coal Resources, Reserves, and Exploration

A.1.1 Reserves estimates for a mine usually include all potentially workable seams to ensure that the mine life criterion in the code for mine design can be met. For example, a mine with a production capacity of 0.45–0.90 Mtpa should have a life of at least 50 years and achieve a specified coal recovery (for example, 85 percent for thin coal seams) to obtain approval for a coal mine project. The concept of reserves being coal that is economically viable to mine had little meaning during the planned economy period, and is still widely misused. New standards were issued for the classification of mineral reserves in June 1999 (table A1.1). The system recognizes the difference between reserves and resources but it is too complex. It is uncertain how effectively this new system is being applied.

A.1.2 Coal exploration in China is usually undertaken by exploration teams, affiliated with local geological bureaus. There were some 25 coal geological exploration bureaus owning 124 geological exploration companies and geophysical exploration enterprises in the 1990s but the majority of them have been suspended or changed their business practices since the 1990s as a result of reductions in state expenditure. The geological information once administratively passed to the mining enterprises is now a commodity, and in some areas geological exploration bureaus are participating as equity partners in new mine developments. Many coalfield areas have been extensively explored by drilling, although the information is not always complete and rarely up-to-date. For example, the total thickness of a coal seam may be recorded, but no analysis is made to determine its composition. As the geological bureaus operated independently of the mining bureaus, information has not been gathered to meet specific coal project development needs. Despite the wealth of data available, there is no formal right of access to the information although provincial government, mining, and geological authorities are increasingly cooperative with prospective developers. The levels of fees for information appear to be highly variable.

Table A1.1. Classification of Mineral Resources and Reserves

	<i>Proven Mineral Resources</i>			<i>Potential Mineral Resources</i>
	<i>Proven</i>	<i>Controlled</i>	<i>Inferred</i>	<i>Predicted</i>
Economic	Recoverable reserves (111) Basic reserves (111b)			
	Predicted recoverable reserves (121)	Predicted recoverable reserves (122)		
	Basic reserves (121b)	Basic reserves (122b)		
Marginally economic	Basic reserves (2M11)			
	Basic reserves (2M21)	Basic reserves (2M22)		
Less marginally economic	Resources (2S11)			
	Resources (2S21)	Resources (2S22)		
Potentially economic	Resources (331)	Resources (332)	Resources (333)	Resources (334)

Note: Codes in the table (111-334). The first number represents the economic meaning: (1) economic, (2M) marginally economic, (2S) less marginally economic, (3) potentially economic. The second number shows the feasibility evaluation stage: (1) feasibility study, (2) prefeasibility study, (3) general study. The third number indicates the geological reliability: (1) proven, (2) controlled, (3) inferred, (4) predicted, (b) recoverable reserves without subtracting the design and mining loss.

Source: GoC

Acquisition and Transfer of Exploration and Mining Rights

A.1.3 Acquisition of exploration rights. The exploration right is approved by the land and resources administration in accordance with the following procedure:

1) The applicant should submit an application to the responsible land and resources department that includes:

- application/registration letter and a map of the exploration block
- copy of the qualifications certificate of the exploration organization
- exploration work plan, survey contract, or certification document for exploration authority
- exploration implementation options

- certification that finance is available
 - other materials required by the geology and mineral resources department under the State Council.
- 2) Consultation between the land and resources department and the coal department.
 - 3) The land and resources department reviews the application.
 - 4) The land and resources department should decide on the application within 40 days and either issue the exploration license or give a reason for refusal.

A.1.4 Acquisition of mining rights. The mining right should be approved by the land and resources administration in accordance with the following procedure:

- 1) The applicant should submit the mining application report to the responsible land and resources department² that includes:
 - application letter and a map of the proposed mining area
 - certification of the qualifications of the applicant
 - options for mineral resources development and use
 - approval documents of the establishment of a legal mining enterprise
 - the EIA report for the proposed mining operations
 - other materials required by the geology and mineral resources department under the State Council.
- 2) Consultation among the land and resources, environmental protection, and coal administration departments.
- 3) The land and resources department reviews the application.
- 4) The land and resources department should decide on the application within 40 days and either issue the mining license or give reasons for refusal.

A.1.5 Transfer of exploration and mining rights. When an exploration right owner or mining right owner applies for the transfer of an exploration or mining right, the following procedures apply:

- 1) The following documents should be submitted:
 - application letter for transfer
 - transfer contract between the companies involved in the transfer

² For mining those mineral resources in a state-planned area or those mineral resources in a mining area with important value to the national economy, and those special minerals for which protected mining is required by the state, the mining application should also be submitted to the competent department concerned under the State Council for approval.

- certification document of the qualification of the company acquiring the right
 - certification of the eligible transfer
 - report on mineral resources exploration or mineral resources mining
 - other materials required by the approving department (when a state-owned mining enterprise transfers the mining right, the approval document issued by the competent department on the mining right transfer should also be submitted).
- 2) The land and resources department is responsible for the review of the application.
- 3) The responsible land and resources department should decide on the application within 40 days of receipt of the transfer application report, and inform the applicants of the decision.

Major Documents Required for Approval of Coal Mine Construction

A.1.6 **Overall Planning of Mining Area.** In accordance with the stipulations of relevant laws, regulations such as the Mineral Resources Law and the Coal Law, the overall planning of a mining area should be prepared consistent with the plan for national economic and social development before developing the coal resources. The overall planning of a mining area should be undertaken by the government, entrusted to the provincial (autonomous region, municipality) planning commission. The eligible design institute can compile the overall planning, which should be closely linked to local planning. After review and approval by the NDRC, the overall planning of a mining area becomes the guiding document for the mining area development. The investor must conform to the overall plan of the mining area. The overall planning should be performed on the basis of the preliminary exploration and the necessary detailed exploration of the coal resources in the mining area. The contents include: objectives, necessity, guidelines and principles of mining area development; condition of coal resources, mining field division and construction scale; preliminary plan of mining sequence; comprehensive development plans of the mining area and the introduction of matched projects; utilities project construction in the mining area; and environmental protection. The overall planning can be regarded as one reference for compiling a coal mine construction project proposal (namely, a prefeasibility study report).

A.1.7 **Project Proposal (for project establishment).** According to the mining field scope and construction scale stipulated in the overall planning of the mining area, the construction organization, or construction organization authorized design consulting company, carries out the study of main issues such as internal and outside conditions of the construction project, products' market, technological and economic feasibility, and so forth, mainly giving solutions to the issues with regard to industry policy, industry distribution, and general supply and demand balance. Subject to the construction scale, the project proposal should be reviewed and approved by the NDRC, or provincial

planning commission, and the project proposal can be used as the design reference for the project feasibility study report.

A.1.8 Project Feasibility Study Report. Based on the principles determined in the project proposal and review comments, detailed technical demonstration should be performed concerning the technical option and mining process, analysis should be conducted for the technological and economic feasibility of the project, and the legal person of the project should be identified. The project feasibility study report is reviewed and approved by the NDRC, or provincial (autonomous region, municipality) planning commission, and then used as the reference for the preliminary design.

A.1.9 Environmental Impact Assessment Report. In accordance with the stipulations in the “Management regulations concerning environmental protection of construction project,” an EIA report should be compiled for all construction projects with impact on the environment. The EIA report should be completed during the project feasibility study. The main contents of the EIA report include: (a) investigation and evaluation of the environmental status, (b) identification of environmental impacts, (c) prediction and evaluation of environmental impact, (d) mitigation measures for negative impacts, (e) environmental monitoring plan, (f) benefit and cost analysis of environmental economy, and (g) investment estimate of environmental protection. The EIA report is reviewed and approved by the Environment Protection Administration, and used as the reference for the project preliminary design.

A.1.10 Safety Evaluation Report. This is a new requirement to ensure full consideration has been given to safety laws and regulations in the design. The report is reviewed and approved by the safety supervision bureau.

A.1.11 Preliminary Design. In accordance with the approved feasibility study report, the project owner selects an eligible organization by tendering to perform preliminary design of single engineering. The intent is to: (a) identify the design options and key technological principles; (b) meet the requirements of mechanical and electrical equipment, instrument purchase and land acquisition, using the preliminary design as a reference for construction drawing design, construction organization design, construction preparation, and production preparation; and (c) compile the project budget and use it to control construction investment and arrange annual plans. The designs from this stage and later usually do not need state approval.

A.1.12 Project Construction Start Report. Having completed the tasks of the “four connections and one leveling” (connections of road, electricity, water and telecommunication, and construction site leveling), the following steps are taken: (a) review and submission of construction drawings, (b) identification of the construction contractor by tendering, (c) the supervision contractor of project construction enters the site, and (d) capital for project construction is made available. The project start report should be reviewed and approved by the NDRC or provincial planning commission.

A.1.13 Acceptance of Project Completion. The acceptance of project completion involves a full examination of the construction work to: (a) check if the project construction conforms to the design requirement and engineering quality, (b) promote the on-time operation of the project, and (c) bring into play the investment

effectiveness. Large and middle-size construction projects should be accepted by the NDRC or the NDRC authorized competent department and local competent department.

Current Coal Mine Design Standards In China

<i>Design Standards and Regulations</i>	<i>Issue Department and Issue Date</i>	<i>Main Contents</i>
Overall design standards of coal mining area (MT5006—94)	Ministry of Coal Industry October 1, 1994	Mining area development, coal preparation and processing, overall surface layout of mining area and flood control, auxiliary enterprises and facilities in the mining area, plan for administration, education, hygiene facilities and residential area within the mining area, ground transport in the mining area, electricity supply, information network, water supply and discharge, heat supply, comprehensive utilization, safety and hygiene, environmental protection, technological economy in the mining area.
Mine design standards of coal industry (GB50215—94)	State Administration of Technology Supervision, Ministry of Construction March 1, 1995	Mine's coal reserves, designed production capacity and service life, mining field development and preparation, shaft, pit bottom and drift, mining method and equipment, hydraulic mining, coal pillar left and mining of restricted coal, underground transport, ventilation safety and heat damage control, mine hoisting, ventilation, water drainage and air compression equipment, expansion of active mine, surface production system, overall layout of industrial site and flood control, ground transport, electricity supply, electricity distribution and lighting, mine production monitoring and controlling, automation, signal, telecommunication and computerized management of mine production, surface buildings, water supply and discharge, heat supply and ventilation.
Design standards of surface mine engineering (GB50197—94)	State Administration of Technology Supervision, Ministry of Construction, September 1, 1994	Mining field boundary, reserves calculation, designed production capacity, development method, mining procedures, mining process, internal transport, excavation site, highwall stabilization, underground water control, water seal and drainage, production system, electricity supply and distribution, electricity supply for electric transportation, central control, monitoring and computerized management, railway signal, telecommunication, mechanical and electric equipment repair, industrial and residential buildings on the surface of the surface mine.
Design standards of coal preparation plant of coal	Ministry of Coal Industry October 1, 1994	Coal receiving and raw coal storage, screening, waste separation and crushing, coal preparation process and equipment, dewatering, anti-freezing and drying, coal

industry (MT5007—94)		slime treatment, products storage and loading, refuse and slime use, metering and coal quality inspection, mechanical and electric equipment repair, overall layout of industrial site, loading and unloading stations by railway, gathering and distribution station, electricity supply and distribution, lighting, telecommunication, monitoring and control, water supply and discharge, heat supply and ventilation for heating.
Design standards of mechanical and electrical repair facilities in coal mining area (MT/T5008—94)	Ministry of Coal Industry November 1, 1994	Introduction to repair plant, processes of each repair workshop, overall layout, transportation, buildings and structure, electricity supply, water supply and discharge, heating and ventilation, power supply station, heat and power distribution, occupational safety and hygiene, environmental protection and comprehensive utilization, technological economy.
Design regulations of small coal mines of coal industry	Ministry of Energy September 11, 1992	Mine's coal resources, recoverable reserves, underground transport, ventilation and safety, equipments for hoisting, ventilation, water discharge and air compression, surface production system, overall layout, surface transport, electricity supply and distribution, automation, monitoring, signal and telecommunication, surface buildings, environmental protection, technological economy.

Acquisition of a Coal Production License

A.1.14 Clause 23 of the Coal Law stipulates that in order to obtain the coal production license, the following conditions should be in place:

- 1) A legal mining license has been awarded.
- 2) Coal mine production facilities must conform to the regulations governing coal mine safety issued by the state.
- 3) The mine director should be trained and eligible to obtain the Certificate of Mine Director's Qualification.
- 4) Staff should be trained and have the appropriate qualifications.
- 5) Telecommunications should be in good working order.
- 6) Plans should be completed for surface and underground engineering, including the ventilation system.
- 7) Coal mine safety and environmental protection facilities have been accepted as certified when the construction project was completed.

- 8) Other conditions stipulated by laws and administrative regulations should be met.

A.1.15 When applying for the coal production license, a coal enterprise must submit an application letter and documents and materials consistent with the above conditions to the coal department under the State Council or provincial, autonomous region and municipality coal authority as appropriate. A decision should be made within 60 days of receipt of the application letter and the relevant documents submitted by the coal enterprise. The responsible coal department must either issue the license or provide reasons for refusal.

Laws And Regulations Relevant To Coal Mining Safety And Health

<i>Name of Laws and Regulations</i>	<i>Implementation Date</i>	<i>Main Contents Relevant to Coal Mining</i>
Regulations governing silicosis disease control	Issued and implemented by the State Council on December 3, 1987	<p>The enterprise or institution's person in charge is directly responsible for the control of silicosis disease of the enterprise or institution.</p> <p>Any enterprise with dust operation should control the dust concentration at operation sites to a level not exceeding the state hygiene standards.</p> <p>For newly constructed or expanded engineering projects with dust operation, the dust control facilities should be designed, constructed, and operated simultaneously with the main project.</p> <p>The health administrative department, labor department, and trade union should perform supervision of silicosis disease control of the enterprise and institution.</p> <p>The on duty staff and the retired must receive health examinations on a regular basis.</p> <p>Those staff who are diagnosed with silicosis disease should leave the job with dust operation and receive therapy and recuperation.</p> <p>For any behavior violating the stipulations of regulations and rules, punishments should be given, including: warning, treatment in a given period, fines, and stopping operation for rectification.</p>
Mine Safety Law	Approved by the Standing Committee of the National People's Congress on May 1, 1993	<p>The safety facilities of mine construction projects should be simultaneously designed, constructed, and operated with the main project.</p> <p>Mine operation should have the conditions for secure and safe production, following the mine safety regulations and industry technical standards.</p>

		<p>The mine enterprise should adopt precautions for the hidden dangers to mine safety,</p> <p>The mine enterprise should establish and perfect a safe production responsibility system, and the mine director should be responsible for the safe production of the enterprise.</p> <p>The mine enterprise is not allowed to let female staff work underground.</p> <p>The mine director should be examined and have professional safety knowledge; the “special operators” should receive special training, be awarded with the certificate for operation qualification, and only then go on duty.</p> <p>If any serious accident happens, governmental departments concerned, trade unions, and mine enterprises are responsible by law for the investigation and treatment of the accident.</p> <p>Any behavior violating the law should be ordered to stop in a given period and fines should be imposed; production should be stopped for rectification; mining license and business license should be withdrawn. If any enterprise’s person in charge commands against rules and regulations or forces workers to perform risky operation or takes no measures against hidden dangers, resulting in an accident with serious fatalities, the person in charge should assume criminal responsibility for the accident.</p>
Labor Law	<p>Approved by the Standing Committee of the National People’s Congress and implemented since May 1, 1995</p>	<p>The employer should provide the laborers with the labor safety and health conditions and necessary labor protection articles as stipulated by the state, and provide regular health examination for those laborers engaged in work with occupational risk.</p> <p>The laborers engaged in technical jobs should be trained before going on duty.</p>
Regulations governing coal mine safety supervision	<p>State Council Order No. 296, implemented since December 1, 2000</p>	<p>The State Council decides to establish the coal mine safety supervision organization, which performs its duty by law, and is not subject to any illegal interference by any organization and person.</p> <p>When finding any hidden danger, the coal mine safety inspector has the right to remove or solve the hidden danger in a given period; in case the staff’s life is threatened, the coal mine safety inspector has the right to require the mine to stop production, and give the order that staff must escape from the risky area.</p> <p>The coal mine safety supervision organization performs the supervision of the implementation of coal mine safety laws, regulations, standards, safety regulations, and technical standards.</p> <p>When the coal mine safety inspector performs his duties, he is required to show his safety supervision certificate.</p>

Coal mine safety regulations	Issued by the State Administration of Coal Mine Safety Supervision and implemented on November 1, 2001	<p>The coal mine safety supervision organization has the right to impose a penalty for malpractices. Such penalty can include: warning, administrative penalty, stopping production for rectification, withdrawing the mining license and coal production license, mine closing, and fines below 100,000 Yuan.</p> <p>Including underground mine, surface mine and occupational risk.</p> <p>The coal mine enterprise must establish and perfect the leadership, duties, organization, and the safety production responsibility of a person on duty.</p> <p>Staff have the right to stop any malpractice and to refuse to follow illegal commands.</p> <p>Staff having not been trained in safety are not allowed to go on duty.</p> <p>The underground miners should be equipped with self-rescuer.</p> <p>Products that have not been awarded with a mine use safety mark and are relevant to mine safety are not allowed for use in mines.</p> <p>The temperature at driving faces is not allowed to exceed 26 degrees.</p> <p>When the CH₄ concentration in the air flow of the air return roadway exceeds 1 percent, operation should be stopped immediately, and personnel should be withdrawn.</p> <p>The high gassy mines and coal and gas outburst mines should be equipped with safety monitoring systems.</p> <p>Coal mines should have a mine rescue team to serve the mine.</p> <p>The allowed maximum total dust concentration of the air at an operation site is 2 mg/m³ (if the airborne SiO₂ concentration in the dust is greater than 10 percent).</p> <p>The noise level at an operation site should not be greater than 85 dB(A).</p> <p>Operators who are exposed to dust, toxic substance, and harmful physical factors should receive regular health examination.</p>
Occupational Disease Control Law	Issued on October 27, 2007, implemented since May 1, 2002	<p>All employers should create a working environment and conditions conforming to the occupational health standards and hygiene requirements, and be responsible for the occupational diseases developed in the enterprise.</p> <p>The Establishment of Project should perform an occupational risk assessment, the design, construction and operation should be reviewed and approved regarding occupational health conditions.</p>

		<p>The employer should have accident insurance.</p> <p>The laborer has the right to understand the occupational risk factors at the operation site, their results, and precautions which should be taken, the right to refuse malpractice and operation without occupational disease protection facilities.</p> <p>All laborers should receive health training.</p> <p>Those diagnosed with occupational disease should be cured, restored to health, and regularly examined by the employer.</p>
Safe Production Law	Approved by the Standing Committee of the National People's Congress, and implemented since November 1, 2002	For the purpose of enhancing safe production supervision and management, preventing and reducing safety accidents, securing people's life and properties, and promoting economic development, the law is drafted with its main contents as follows: (1) safe production security of operation units, (2) rights and obligations of the employee, (3) emergency rescue, investigation and treatment of accidents, and (4) legal responsibility.

Environmental Laws, Regulations, and Policies

National Legislation and Policies

<i>Name of Laws , Regulations, and Policies</i>	<i>Issuance Date</i>	<i>Main Contents</i>
Environmental protection law	Revised in 1989	China's basic environmental protection law,
Water and soil conservation law	1991	Any development, construction, and production should strictly control the water and soil loss.
China 21 st Agenda	1992	Proposes the strategic task of developing clean coal technology.
Solid waste pollution control law	1995	Proposes the control principles of discharge reduction, resourcefulness, and harmlessness.
Air pollution control law	Revised in 1995	Special law for protecting air environment, with special regulations concerning the control of coal combustion.
"Decision on the improvement of environmental protection," issued by the State Council	1996	States that the "fifteen smalls" including small paper factory, small coking plant, etc., which cause serious pollution and destroy and waste resources, should be closed.
Water pollution control law	Revised in 1996	Special law for protecting water quality.
Ambient noise pollution control law	1996	Special law for the control of ambient noise pollution.
Mineral resources law	Revised in 1996	Stipulates the management system, rules, and measures for ownership, exploration right, and mining right of mineral resources.
Criminal lawsuit law	Revised in 1997	Defines the crime of destroying environmental resources for the first time.
Land management law	Revised in 1998	Land excavated, subsided, and occupied should be reclaimed by the organization that destroyed the land, and the land function should be restored.
Clean production promotion law	2002	Introduces clean production for industrialization.
Environmental impact assessment law	2002	Stipulates environmental impact assessment for construction projects; increases the requirements of environmental impact assessment performed for construction planning.
Management regulations for collection and use of pollution discharge fees, issued by the State Council	January 2003	Stipulates pollution discharge fee management methods, including the verification of pollutant discharge type and amount, collection of pollution discharge fees, use of pollution discharge fees and penalties.

Special Legislation and Policies Targeting the Coal Industry

<i>Name of Laws, Regulations, and Policies</i>	<i>Issuance Date</i>	<i>Main Contents</i>
Coal law	1995	Stipulates the environmental protection requirements and management responsibility during coal exploration, production, transport, and sales.
Management method for coal production license	1996	Stipulates the basic requirement of environmental protection during coal production; the environmental protection enjoys the decisive veto.
Review method of environmental protection for coal production license	1996	Stipulates the contents, standards, and review methods of environmental protection for verifying the issuance of the coal production license.
Design standards of coal industry environmental protection	1990	Stipulates the environmental protection requirements and standards of coal mine design.
“Notice of preferential policies for developing comprehensive utilization”, issued by the State Economic and Trade Commission	2002	Stipulates the tax reduction policies and standards for the comprehensive utilization of coal waste, slime, etc., associated with mineral resources.

Major Documents Concerning Closing And Bankrupting Of State-Owned Enterprises

<i>Main Document</i>	<i>Main Contents</i>
Notice of instructions to the closing and bankrupting of state-owned enterprises (Meifangzhi No. 215 [1999])	<ul style="list-style-type: none"> • Closing and bankrupting scope of SOCMs. • Principles to be followed. • Implementation plan. • Policies for closing and bankrupting.
Notice of issuing the “implementation methods for the closing and bankrupting state funded enterprises, deregulated enterprises of coal industry and non-ferrous industry” (Document No. 32 [2000])	<ul style="list-style-type: none"> • Organization and leadership of enterprise closing and bankrupting: the leadership group of national enterprise acquisition and bankrupting and staff re-employment (the Leadership Group) is responsible for the organization, leadership, and supervision of enterprise closing and bankrupting. The relevant provincial party committee and people’s government is responsible for the organization and implementation. The industry management department concerned is responsible for the policy support and coordination. • Application and predesigned option for a closing and bankrupting project: the department in charge of the enterprise proposes the list of enterprises to be closed, drafts the option, and submits it to the Leadership Group. • Review and approval of closing and bankrupting projects: the bankrupting option should be reviewed by the SETC, the Ministry of Finance, the People’s Bank of China, the Ministry of Labor Security, as well as relevant creditor banks and financial assets management companies. After prereview, the Leadership

	<p>Group organizes relevant departments to jointly review the bankrupting option. On the basis of agreement by parties involved; the Leadership Group issues a document after approval by the State Council.</p> <ul style="list-style-type: none"> • Preparatory work before enterprise bankrupting: identifying the creditor's right of banks and financial assets companies; drafting the bankrupting option and soliciting comments from banks and assets management companies; and identifying the expenses that are paid by the central government's budget. The local government where the enterprise is located should take over and implement the management services for the retired and distribute the basic pensions. The social function of the enterprise should be fully transferred to the local government. The staff resettlement option should be drafted based on the involuntary principle and the labor relationship should be terminated. The closing and bankrupting option should be approved by the workers' congress. • Staff concerns: broadly learning the staff's comments, explaining and solving the issues that the staff are concerned about, so as to ensure social stability. • Dealing with the problems arising from the enterprise closing and bankrupting: after the bankrupting is completed, the bankrupting working group cannot be dismissed randomly; however, it should deal with the problems arising from the closing and bankrupting, including arrangements for extra-poor staff and promotion of staff reemployment; helping social insurance agents achieve social distribution of basic pensions, including the retired in the management of the community or special organizations. When the work is completed, the person in charge of the project should prepare a working report of the closing and bankrupting, which is submitted to the Leadership Group after it has been discussed and accepted by the bankrupting working group.
<p>Comments on relevant issues in carrying out the "Notice by Administrative Office under the Chinese Communist Party Central Committee and the Administrative Office under the State Council concerning the closing and bankrupting of the resources depleted mines," (Document No. 33 [2000])</p>	<ul style="list-style-type: none"> • Conditions for staff early retirement. • Distribution standards of basic pensions for the early retired staff. • Calculation of economic compensation amount. • Staff arrangements for assets restructuring. • The transfer of social functions of the closed and bankrupted enterprises and subsidies for such transfer. • Examination and assessment of staff health. • Benefits for injured staff. • Special management organization for the retired, etc.

Regulations And Documents Concerning Small Mine Closures

<i>Main Documents</i>	<i>Main Contents</i>
<p>Notice by the State Council concerning the issues relating to closing illegal and unreasonably distributed mines (Guofa No. 43 [1998])</p>	<p>Scope of mine closing :</p> <ol style="list-style-type: none"> 1. Any small mine without mining license and production license (two licenses) and constructed in the mining field of a state-owned mine since January 1, 1997, should be closed by law. 2. Any mine constructed in the mining field of a state-owned mine before January 1, 1997, and failing to have both of the two licenses should be closed; any small mine outside the mining field of state-owned mine, and failing to have both of the two licenses, should stop production for rectification. Those small mines failing to reach the standards for licenses by the end of February 1999 should be closed. Mines that mine high-sulfur, high-ash coal and without effective sulfur and ash removal measures, should be closed. 3. Any small mine constructed in the mining field of a state-owned mine before January 1, 1997, should be closed, even if it has the two licenses and produces coal legally. Its unreasonable distribution affects the long-term development of the state-owned mine. 4. Review and approval of any new coal mine should be stopped in all provinces during mine closing for reduced production. Departments concerned are not allowed to change and issue the two licenses, and the business license for those coal mines need to be cancelled and closed. Railway and highway departments are not allowed to provide transport services for these mines; relevant departments and commerce organizations are not allowed to purchase their coal; power supply departments are not allowed to supply electricity; banks are not allowed to open bank accounts and provide loans for these mines; and residential blasting materials supply departments are not allowed to provide explosive products. 5. The closing of legal small mines should be treated case by case and comprehensively considered. The specific compensation method is drafted and implemented by each provincial government. After the legal small mines are closed, the central government should provide a certain subsidy to the region where the closing has a remarkable impact on local financial revenues and where the local fiscal budget is in a difficult situation. The subsidy method is drafted by the State Economic and Trade Commission, in consultation with the Ministry of Finance and the State Administration of Coal Industry. 6. Or Organizing, leadership, supervision and acceptance: Each province should establish the mine closing and production control leadership group with the governmental leader in charge as the director. Meanwhile, the law enforcement and supervision organization for mine closing and production control should be established, which consists of the sectors of coal , geology and mineral resources, industry and commerce, supervision, public security, environmental protection, power, and carries out the joint law enforcement, supervision, checks, and acceptance.

<p>Urgent notice by the Administrative Office under the State Council concerning the closing of small mines affiliated to state-owned mines and the production stopping and rectification of township mines (Document No. 25, 2001)</p>	<p>Closure scope :</p> <ol style="list-style-type: none"> 1. Any small mine constructed in the mining field of the state-owned mine should be closed. 2. Any mine failing to have the two licenses, the business license and the certificate of mine director qualification, and producing high sulfur and high ash coal, should be closed. 3. Any mine, which does not have safe production conditions and has one of the following cases, should be closed: single hole mine; mechanical ventilation is not equipped in the mine; without rational water discharge system; without use of special explosion-proof electric equipment; without use of special container for vertical transport of mining personnel; high gassy mine; and coal and gas outburst mine without perfect monitoring methods and measures. <p>Checks and acceptance: A legal township mine whose safe production conditions reach the stipulated standards can restore production after having been checked and accepted by the inspection team consisting of the local county governmental official in charge and the coal mine safety supervisor.</p> <p>Punishment: For small mines affiliated with state-owned mines and for township mines that have been ordered to close or stop production for rectification or that restore production privately after closing, the mine director should be investigated and treated by law, and the local governmental official in charge should be identified.</p>
<p>Notice by the Administrative Office under the State Council concerning the work of further closing and rectifying the small coal mines and coal mine safe production , 2001</p>	<p>Closing of small mines should reach the following requirements: For the small mines ordered to close, the government departments concerned should cancel and withdraw their licenses in a given period, destroying the mine shaft, leveling the site, issuing the announcement, and requiring the mines to restore vegetation or perform reclamation as stipulated.</p> <p>Properly solving the problems concerning the small coal mine closing : Local government should redeploy the staff of closed small mines in accordance with the state laws, regulations, and policies. Those staff with urban residences and having participated in the employment insurance should be awarded with financial compensation and enjoy employment insurance as stipulated; those who are eligible for enjoying the minimum living security of urban residences should enjoy corresponding benefits. The rural contract miner should be given economic compensation; those who signed a labor contract with a state-owned mine or a small mine affiliated with a state-owned mine and whose contract has not expired, should be resettled by the mine the staff used to work for. The resettled and reemployed staff should continue their social insurance and continue to pay social insurance fee.</p> <p>The expenses incurred during small coal mine closing should be borne in principle by the local government. If the small mine closing and staff resettlement is too heavy to be borne by the local fiscal budget, the central fiscal budget will provide proper subsidy.</p>

Reporting And Approval Procedures For Share Issuing In China

A.1.16 Open share issuing in China should experience strict review. Any limited company to issue open (public) shares should not only obtain the license for a certain amount of shares, but also submit relevant materials and get approval from administrative authority and securities supervision and management authority.

Reporting of Share Issuing

A.1.17 The limited company applying for open share issuing (including an approved Limited Company to be established) is required to submit relevant materials to the provincial government or the central enterprise management department in charge. After approval, the Limited Company can submit relevant materials to the China Securities Regulatory Commission (CSRC).

A.1.18 The materials required for submission to the provincial government or central enterprise management department in charge are as follows:

- Application report of issuing shares (if there is a type “A” share, a brief explanation of share types could be given in a footnote).
- The initiators’ or shareholders’ board agrees to open the resolution of share issuing.
- Approval document establishing the Limited Company.
- The business license of the Limited Company or registration certification of the Limited Company to be established, which is issued by the administrative department of industry and commerce.
- Company statutes or draft company statutes, and prospectus.
- Feasibility study report of capital use; for fixed assets investment projects requiring state capital or other conditions, an approval document should be presented, indicating that the fixed assets investment project has been approved by the governmental department concerned.
- Financial reports of recent three years, audited by an accountants’ agent, and the auditing report signed by two or more registered accountants and stamped by their agent.
- Legal comments signed and stamped by two or more lawyers and their agent regarding relevant matters.
- The assets assessment report signed and stamped by two or more specialized evaluation persons and their agent; the assets review report signed and stamped by two or more registered accountants and their agent. If state assets are involved, the confirmation document by the state assets management department should be provided.

- The approval document by the state assets management department regarding the state share management option of the Limited Company (the approval should refer to the transformation of the enterprise's share system, demarcation of state-owned shares, shares equivalent option for initiators' assets and share price, as well as share holding arrangements for state shares).
- Confirmation document and approval document by the provincial or higher level land management department regarding the land evaluation results and the disposal option of state-owned land occupied by the Limited Company (including the approval for the land evaluation results, disposal of state-owned land, sales and lease arrangements for state-owned land).
- Sales option and sales agreement of share issuing.
- Other materials are required by the local government or central enterprise management department in charge to report. The application document for share issuing and documents to be reviewed by the document submitter to the CSRC should include, in addition to the documents submitted to the provincial government or central enterprise management department in charge, approval documents by local government and central enterprise management department for share issuing.
- Other documents required by the CSRC.

Approval Procedures for Share Issuing

A.1.19 A two-level approval procedure (prereview and review) is performed in China for share issuing.

A.1.20 The prereview authority is the provincial government or central enterprise management department in charge, which is subject to the administrative jurisdiction of the enterprise. The local government or central enterprise management department in charge should make a decision for approving or not approving the application within 30 working days after the receipt of the share issuing application, and require the applicant to submit the materials to the CSRC for review.

A.1.21 The review authority is the CSRC. After the application for open share issuing is prereviewed and approved, the applicant should report to the CSRC in accordance with legal procedures. The CSRC should make a decision within 20 working days after receipt of the review application. If the applicant is approved to issue shares openly, the review approval document should be issued (letter of review comments), and the document should be signed by the chairperson of CSRC.

Review and Approval Conditions for Share Issuing

A.1.22 The prereview and review authorities should review the application of the share issuing applicant in accordance with Chinese laws, administrative regulations, and relevant rules. The applicant can get approval only if the applicant meets the legal conditions for open share issuing.

A.1.23 According to the stipulations of laws, administrative regulations, industry rules, such as the Corporate Law and “Provisional regulations governing share issuing and trading management,” etc., the application for initial issuing should meet the following conditions:

- The share issuer must be a Limited Company eligible for share issuing, including the established Limited Company and approved Limited Company to be established.
- Its production should conform to the state industry policy.
- The common shares issued are limited to one type; for shares issued at the same time, the issuing conditions and issuing price should be the same.
- The initiators should subscribe at least 35 percent of the total shares that the company plans to issue.
- Among the total value of shares issued by the company, the shares subscribed by the initiators should be no less than 30 million Yuan, unless otherwise stipulated by the state.
- The part issued to the public should be no less than 25 percent of the total value of shares to be issued, the value of shares subscribed by staff should be no greater than 10 percent of the value of shares issued to the public. If the total value of shares issued by the company exceeds 400 million Yuan, the CSRC can reduce the proportion of the shares to be issued to the public, but to no less than 10 percent of the total value of shares to be issued by the company.
- The issuer has no serious malpractice and no record of false financial statement.
- Other conditions required by CSRC.

A.1.24 When the Limited Company transformed from a former state-owned enterprise applies for open share issuing, the company should conform to the following conditions in addition to the above-mentioned conditions:

- By the end of the last year before issuing, the net assets should account for no less than 20 percent of the total assets; the intangible assets should be no greater than 20 percent, unless otherwise stipulated by CSRC.
- Being in profit in recent years.

Taxes and Exemptions Applicable to Foreign Investors

A.1.25 MOLAR offers guidance to investment in the mining industry (August 2001) and provides the following information. The following types of tax are applicable to all foreign enterprises:

- Enterprise income tax – once a mine begins making profits, it is eligible for a 100 percent exemption for two years, plus a 50 percent deduction for the following three years. The cost of Chinese equipment purchased by the foreign enterprise that falls into the “duty free” category for imported goods can be offset against taxes.
- Individual income tax – 5 percent to 45 percent.
- VAT, consumption tax, and business tax – the VAT on Chinese equipment that replaces similar imported equipment may be refunded in full. Technology transfer is exempt from business tax.
- Import tariff – equipment imported for projects supported by the state are exempt from tariff (average 16.5 percent) and VAT.
- Resources tax.
- Urban land and property tax.

A.1.26 Foreign enterprises that do not have a presence but generate income from within China are required to pay 20 percent of their taxable income. Reductions are applicable in certain special development areas (applicable rates being in the range of 15 percent to 24 percent). An enterprise with a projected life of more than 10 years is exempt from income tax for the first two years after first generating profit, and then pays at 50 percent for the next three years. Incentives for reinvestment are also available.

Other Tax Incentives

A.1.27 Favorable tax policies have been introduced to provide incentives to foreign investors in respect to minerals exploitation in the western regions, CBM exploration, and development and use of waste materials from coal.

A.1.28 **Mineral resources in western provinces.** The government has introduced favorable tax policies to encourage overseas-funded development of mineral resources (excluding oil and gas) in the western region of China. For those wholly overseas funded or Sino-foreign funded development of mineral resources listed in the “Guiding List for Overseas Invested Industries,” the royalty (fee for the use of the mining area) is exempt for five years. For a foreign enterprise that comprehensively exploits the mineral resources, the resources compensation fee is 50 percent or exempt, and the exploration right use fee and mining right use fee is exempt in the first year and 50 percent in the following two years.

A.1.29 **Coalbed methane.** CBM exploration and development with foreign investment also receives preferential tax treatment. The Ministry of Finance and the State Taxation Administration jointly issued a notice on July 5, 1996, stipulating that VAT is

temporarily set at 5 percent; the investment is exempt from resources tax, and the resources compensation fee is also exempt if the annual accumulative production is not greater than 2 billion m³.

A.1.30 **Producing building materials with coal waste and fly ash.** The Ministry of Finance and the State Taxation Administration jointly issued a notice on April 28, 1995, which stipulated that enterprises that produce building materials with raw materials including more than 30 percent coal waste, fly ash, or bottom slag of coal-fired boilers, are exempt from the VAT of the building material.

Annex 2

Current Coal Sector Administrative Practice

Duties of Provincial Land and Resources Bureaus

Shanxi

- Comprehensive administration of mineral reserves, review and granting of mineral reserves, compilation of geological exploration data, registration and statistics of mineral reserves, establishment of mineral reserves accounts, and analysis of mineral supply and demand.
- Development of a mining rights market; supervision of exploration activities and resolution of major disputes regarding exploration rights; administration of geological exploration qualifications; management of province-level geological exploration funds, including organization, implementation and supervision of geological exploration projects funded by the provincial government.
- Review, approval, license issuing, and transfer of mining rights of large and middle-size coal mines; supervision of mineral resources development, including utilization and preservation of resources; annual checks on mineral mining and utilization by mining enterprises; administration and collection of mineral resources compensation fees.

Shandong

- Implementation of national policies, laws, and regulations concerning land, mineral resources, and survey work.
- Design and implementation of provincial land plans, including land utilization and survey development.
- Supervision and inspection of law enforcement of the departments of land resources at all levels and implementation of land, mineral resources, and survey in the province.
- Implementation of the national cadastral administration, organization of land resources investigation, land statistics, and monitoring in the province.

- Formulation and implementation of administration regulations and rules regarding land markets and resources.
- Review and submission of approvals for various land uses to a higher level.
- Administration of approval, registration, and certification; review, approval, and registration of the transfer of exploration rights and mining rights.
- Administration of geological surveys and their results, review and verification of qualifications of geological survey companies.
- Organization of the monitoring of geological hazards and the protection of geological relics and the environment.
- Administration of geological survey fees and other segregated funds allocated by national and provincial financial departments.

A.2.1 Note: Administration of mining rights includes administration of exploration rights and exploitation rights.

Principal Duties of Coal Industry Management Bureaus

Shanxi

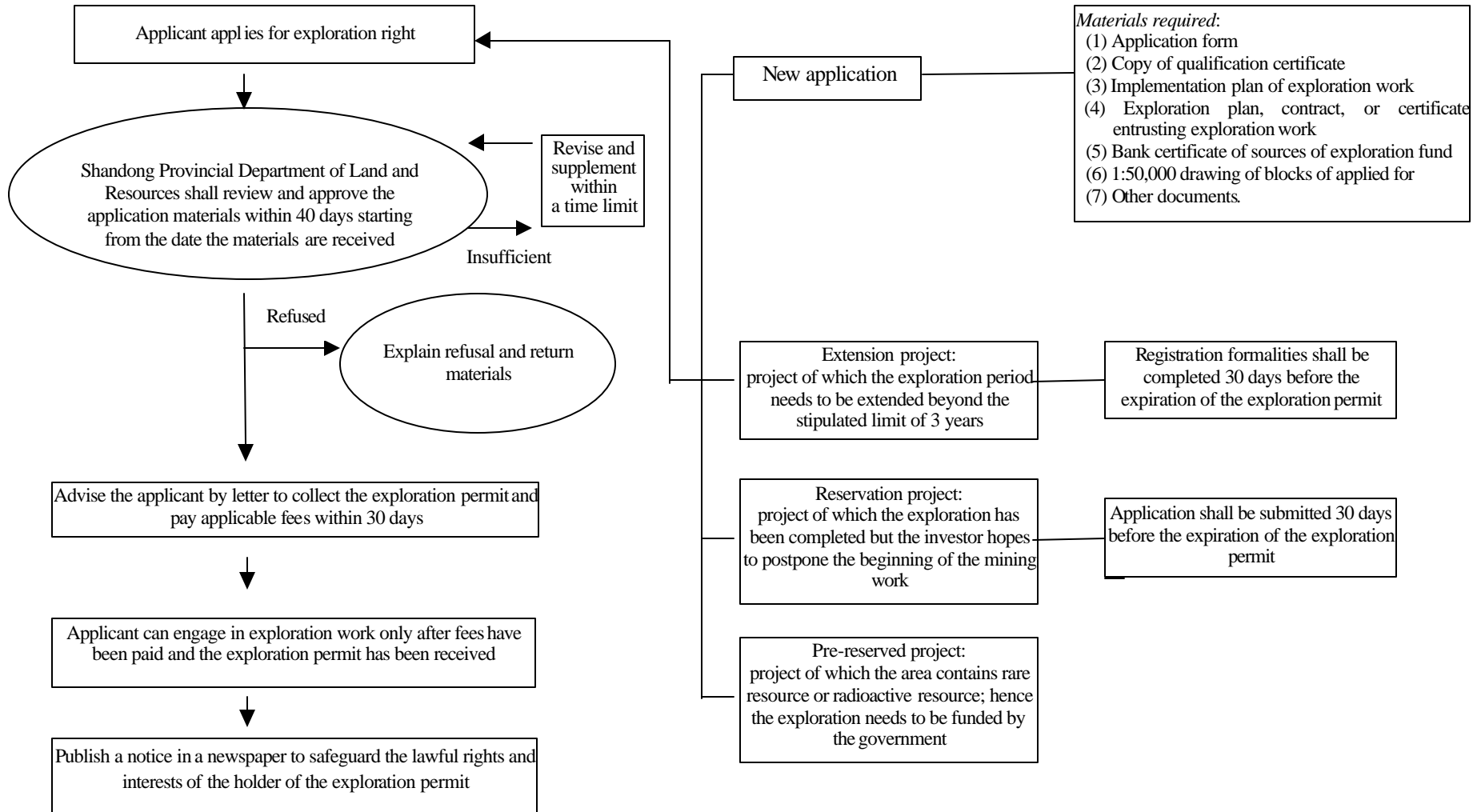
- Studying and proposing the development strategy and plan for the Shanxi coal industry and providing recommendations for promoting the coal industry restructuring.
- Providing suggestions on the policies and regulations concerning coal industry development and supervising the enforcement of relevant laws and regulations by coal enterprises.
- Studying and proposing coal transport strategy; coordinating the relationship of coal production, transport, and sales in the province; organizing the annual coal fair; and coordinating the relationship among the sectors of railway, port, highway, and coal users;
- Studying and proposing policies and measures for coal industry reform and helping coal enterprises reduce losses and advance industrial diversification and redeployment of labor.
- Issuing coal production licenses and the prereview of coal sales licenses.
- Control of coal production and mine closures.
- Technology promotion and evaluation in the coal industry and organizing international exchange.
- Tracking coal production technology and sales developments and issuing information on coal production, technology, and sales.

- Management of coal production subsidies and production maintenance fees.

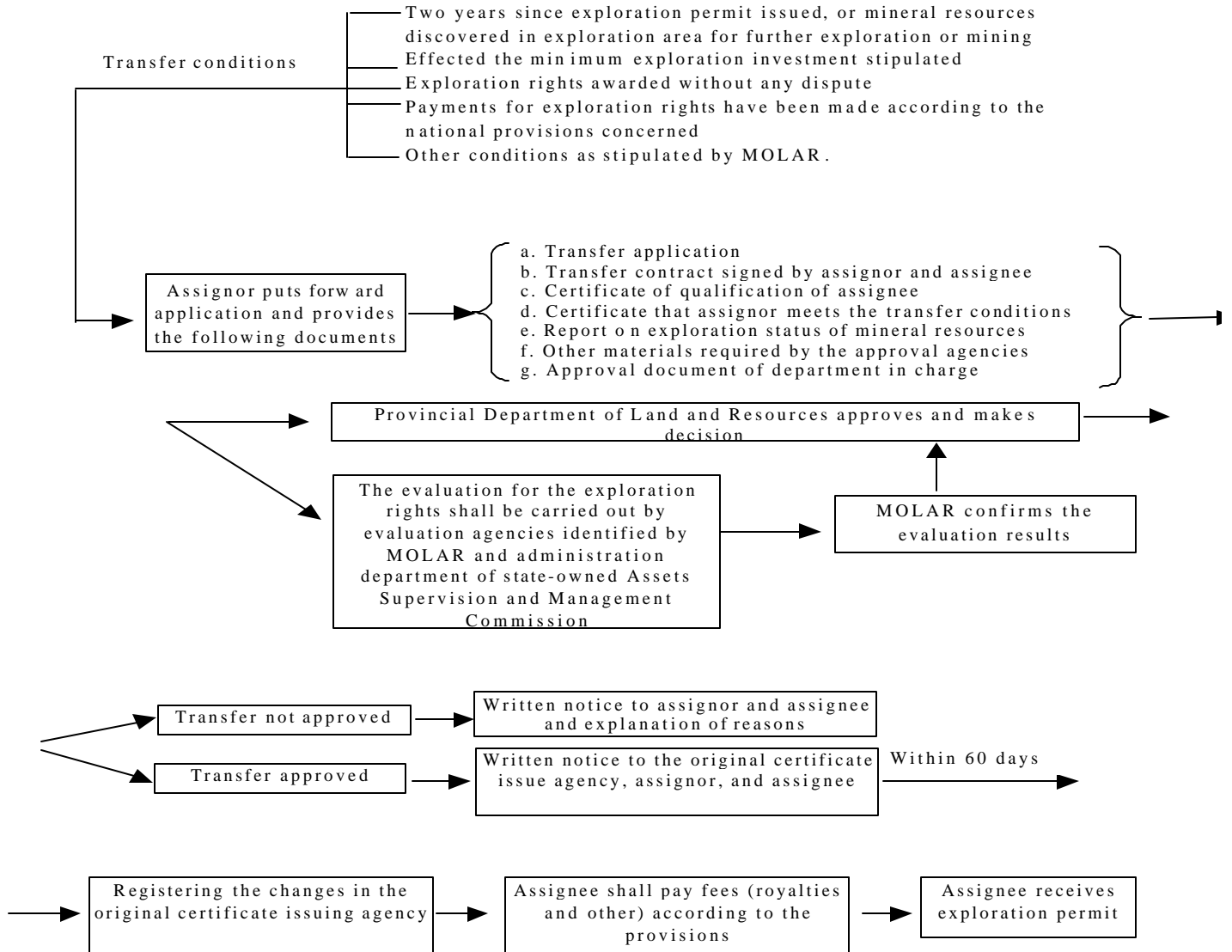
Shandong

- Study and develop the strategy of the provincial coal industry, develop coal sector policies and regulations according to related laws; prepare plans of coal resources, and promote coal industry restructuring.
- Organize and implement coal industry regulations, codes, and technical standards; coordinate coal sector activities and departments; uphold fair competition; study and propose policy recommendations on coal production, supply, and marketing; and guide energy conservation and environmental protection for coal sector enterprises.
- Study and make policy on the provincial coal industry reform; assist state-owned coal enterprises to reform; reorganize, reconstruct, and strengthen coal enterprise management; promote merger and bankruptcy of state-owned coal enterprises; reduce losses and increase profits; guide diversification and alternative employment programs; guide property system reform; and promote cooperation between the coal sector and related industries.
- Close all illegal coal mines according to the law, normalize coal production and operational orders, and provide guidance to coal enterprises for safety management.
- Ensure mines operate within the law and train supervisory and enforcement staff.
- Organize and guide the reform of enterprises and institutions directly under the bureau, encourage coal enterprises and institutions to introduce market systems step by step, and assign office personnel.
- Gather provincial coal production data and analyze trends; collect, analyze, and release coal economic, technological, and market information at home and abroad; provide information and consulting service; and promote scientific and technological innovations and educational training in the provincial coal sector.
- Develop economic and technological cooperation and exchange with foreign countries in the provincial coal sector and develop provincial coal import and export trade.
- Undertake other coal sector-related tasks as required by the provincial Party Committee and the provincial government.

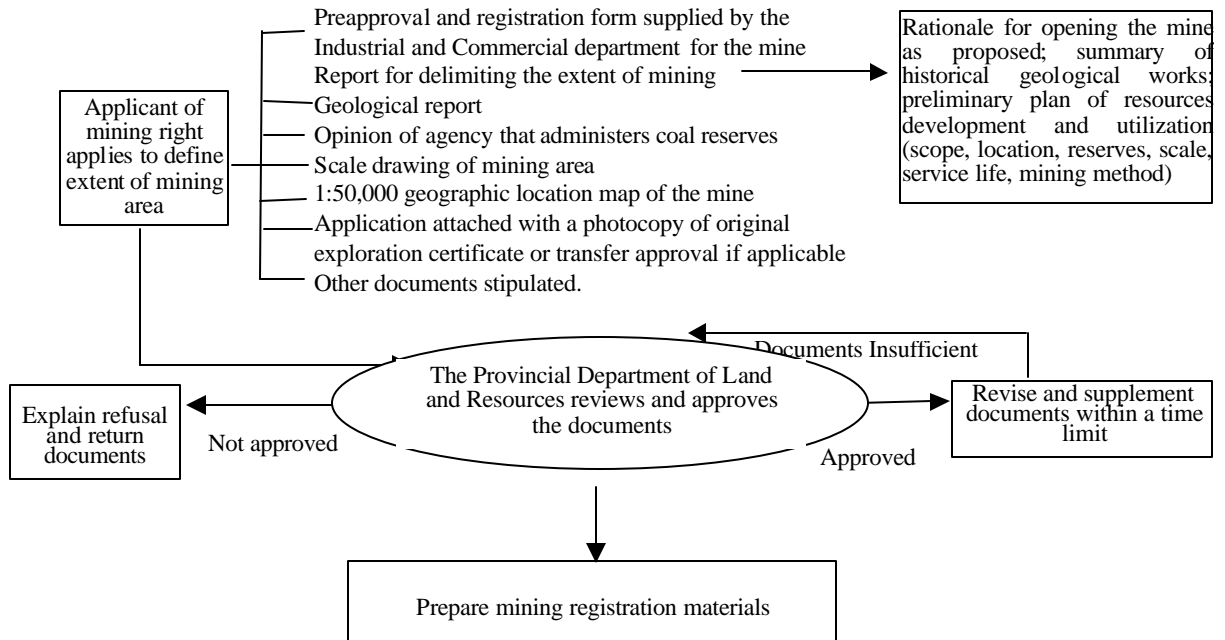
Approval Procedures in Shandong—Exploration Rights



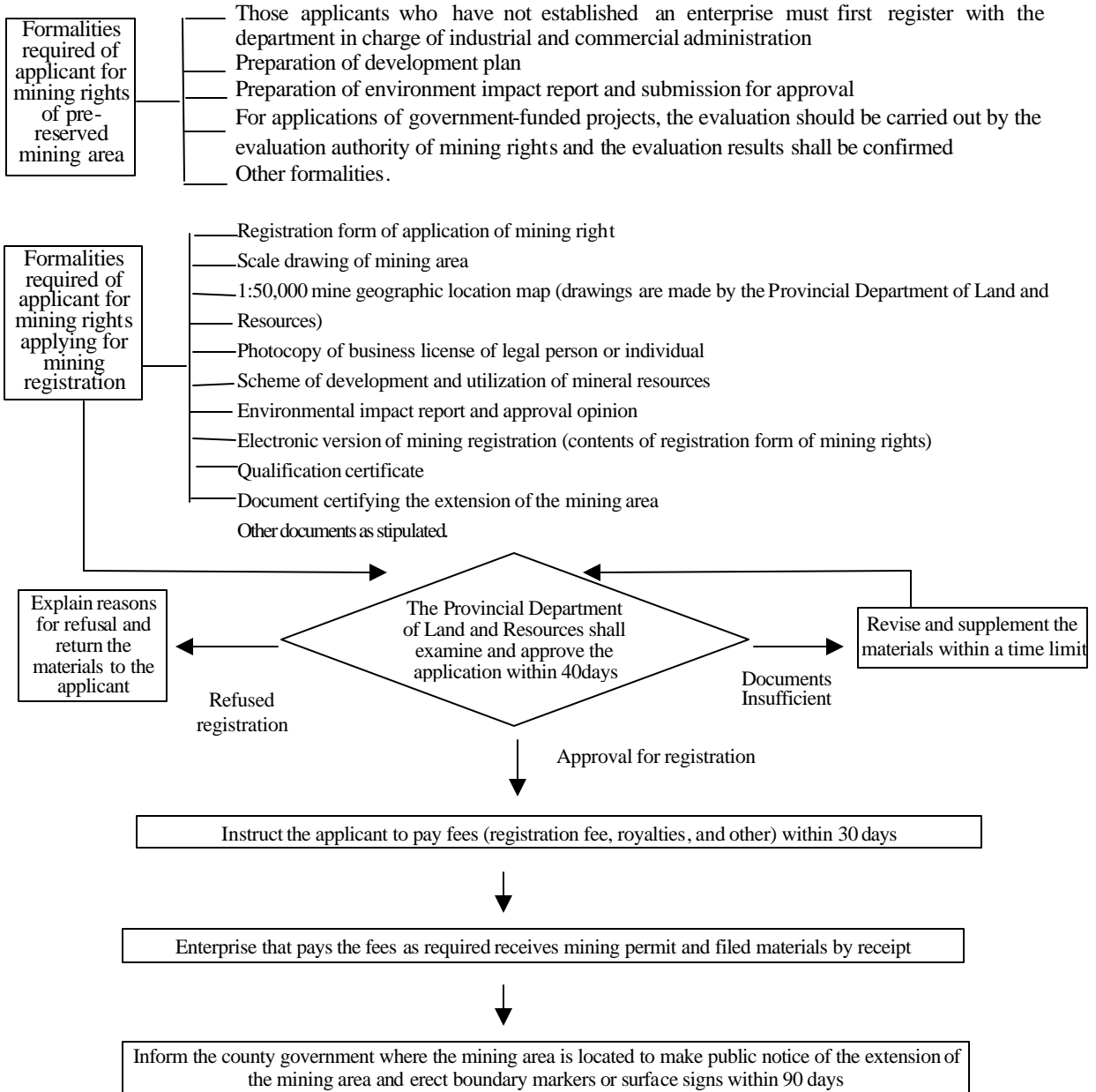
Transfer of exploration rights



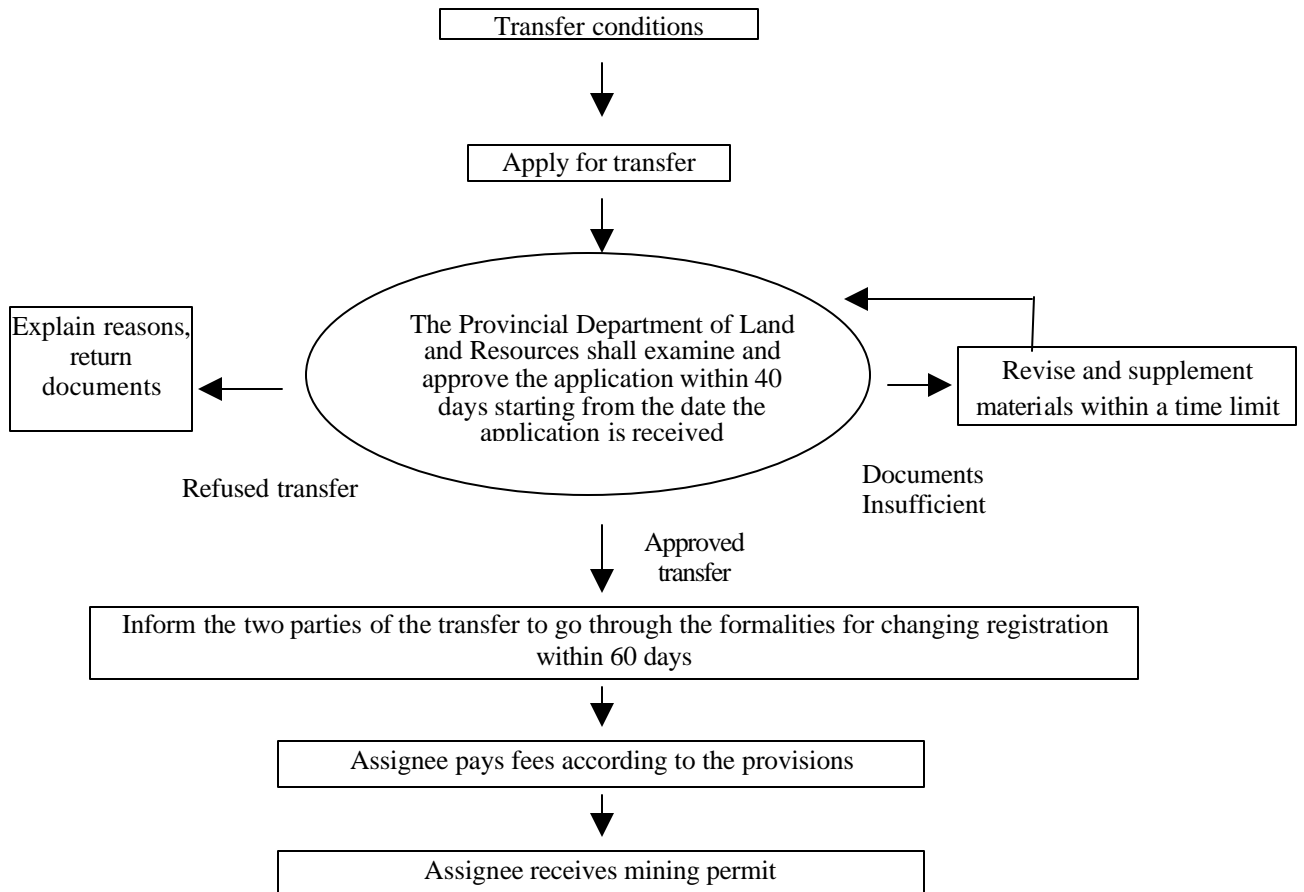
Defining Extent of Mining Area



Examination and Approval of Mining Registration



Examination and Approval of Transfer of Mining Rights



Note: Registration for approval of transfer of mining right is required when a principal part of the mining rights is changing due to combination, separation, joint venture and cooperative business operations or due to the selling of enterprise assets and the changing of the title of an enterprise. The transfer conditions mainly include six requirements such as one full year production of mining enterprise, the mining right itself is indisputable, and all the related fees were paid according to law. There are 12 materials required for putting forward the transfer application, right, and transfer contract.

Conditions for Obtaining a Coal production License

A.2.2 All coal enterprises must meet the following conditions to obtain a coal production license:

- Mining license obtained by law.
- An approved mine design.
- Production systems, such as hoisting, transport, ventilation, water discharge and electricity supply must meet the standards stipulated in the Coal Mine Safety Regulations and other relevant technical regulations, and must be accepted by the higher level coal industry authority as qualified by law.
- The mine director must be qualified by training in a professional organization appointed by the coal industry authorities concerned at the state or lower level government and have been awarded a mine director qualification certificate according to the stipulations issued by the coal industry authorities concerned at the state level.
- Special operators (gas monitoring workers and coal mining machine operators) must be qualified by training in a professional organization according to the stipulations issued by the coal industry authorities concerned at the state level and have been awarded operation qualification certificates issued by an authorized coal mining administration (company) or the local coal industry administration department.
- Mine telecommunications systems (surface and underground, internally and externally) must be operative. Telephones must be installed on coalfaces as well as in other working places and key departments underground in order to maintain direct contact with the surface control room.
- The measures on environmental protection must meet the requirements of existing law and regulations. Appropriate measures should be taken to tackle waste gas and water, waste, noise, as well as surface subsidence caused by coal production. The measures must be approved by the environmental protection section of the coal industry department concerned.
- Certificate indicating that the safety facilities of the mine construction project have been accepted as qualified.
- Basic maps must be available, such as a map of the mining area, topographical and geological maps, a plan for mine development, a ventilation plan, and maps showing the water discharge system,

electricity supply system, underground escape routes, as stipulated by the coal authority concerned at the state level.

- Other conditions stipulated in laws, administrative rules, and regulations concerning coal production.

A.2.3 State-owned coal enterprises and foreign-invested coal enterprises must meet the following conditions in addition to the above conditions:

- Coal seam, extent of mining and reserves approved by the department concerned.
- A geological exploration report.
- Working sections must meet the related provisions made by the coal authority concerned under the State Council.
- Safety measures must have been approved by the departments concerned in accordance with the provisions of safety regulations that concern the prevention of major hazards such as water, fire, gas, coal, and methane outbursts, coal dust, roof falls, etc.

Coal Mine Acceptance Standards

A.2.4 The trial production and acceptance for a coal mine should satisfy the following standards and conditions:

- The major systems, including surface and underground hoisting, transport, ventilation, water discharge and electricity supply, must be complete and operative.
- The first set of mining equipment must have been installed on the face and normal production must be achieved.
- All production systems must run normally, and the equipment performance must be satisfactory, as assessed after a test run.
- The environmental protection, fire fighting, and safety facilities as well as working conditions in the mine must satisfy the relevant stipulations of the state. Major engineering projects have been completed and accepted by the departments concerned.
- The conditions of the mine's engineering quality certification have been met, and the corresponding certificate has been awarded.
- The mine's organization meets the requirements of safe production, and all rules and regulations have been established. Workers are qualified by training, and the special operators have obtained operation certificates. Files and materials (including drawings) are complete.

Measures to Improve mine Safety Introduced by Shanxi Provincial Government

- Promoting coal mine safety improvements under the leadership of the Vice Governor.
- Implementing the coal mine safety evaluation system.
- Drafting options on mine safety solutions, identifying work objectives and priorities. Drafting the acceptance standard for safety improvements of small coal mines. Issuing notices of production stops to small mines.
- Enhancing supervision and checks through improved coordination among coal mining administration departments. Organizing relevant provincial governmental departments to carry out province-wide verification of mine safety law enforcement.
- “Regulations governing safe production of township mines in Shanxi province,” which stipulate that county and township officials in charge will be punished if more than two township mines are found without a mining license or without complete licenses in one township.
- Increasing investment in mine safety (100 million Yuan arranged by the provincial government) and improving the accident response capability of coal mines.

Annex 3

International Comparisons

Coal Mining Sector Administration

A.3.1 Institutional management of the coal mining sector in the comparative countries is aimed at allowing competitive, socially acceptable mining operations, while guarding the safety of the workers and protecting the environment from unacceptable damage. Coal mining in these countries is financed and operated by the private sector, although in some instances there has been state intervention to promote expansion or maintain energy diversity for strategic reasons.

United States

A.3.2 The United States is the second-largest coal producing and consuming country in the world. Coal is regulated at the federal and state levels. While the private sector makes all decisions with respect to mine developments and production levels, the government approval process can be slow because of strict regulations and public hearings to ensure that health and safety, reclamation, and other environmental regulations are to be met. Citizen group litigation to prevent coal mine developments can delay or stop mine developments and may add considerably to the cost of developing new mines.

A.3.3 The U.S. Department of Energy (DOE) is required, on a bi-annual basis, to issue a National Energy Plan. This plan is used to discuss the importance of the domestic coal industry and proposes levels of research on coal-related issues, particularly clean coal technologies. Similarly, the annual budget process sets out the priorities for federal assistance to promote new energy technologies. Since the mid-1980s, clean coal technology development has received about US\$3 billion in U.S. government funding.

A.3.4 The U.S. federal government departments under cabinet agencies have the responsibility to implement laws relating to coal and other mining. State agencies implement laws, when they are given the authority to do so. However, coal is treated no differently than other commodities. The laws are not intended to interfere with free and open competition, but rather to ensure that government properties are properly managed, pollution is controlled, and health and safety of miners and others are protected.

A.3.5 Attention is paid to preventing monopolies that can restrict competition. In this regard, the Department of Justice and related state government agencies are involved in

enforcing federal laws related to the management of coal resources, as they do for other industries.

A.3.6 The Department of Labor has established the Mine Safety Health Administration (MSHA) and the Occupational Safety and Health Administration (OSHA) to manage health and safety issues. Committees directly appointed by the president of the United States are responsible for the judgment of disputes between MSHA, OSHA, and mine owners.

A.3.7 Coal transport is regulated. In addition to the regulation by the Department of Transportation, the Interstate Commerce Committee is also responsible for the review and approval of coal transport routing, determination of reasonable transport fees, and issuance of licenses for coal highway transport, as it does for all transport.

Relevant U.S. Government Agencies

A.3.8 At a federal level, the following agencies have key roles to play regarding coal mining:

- Department of the Interior
- U.S. Geological Survey – maintains a national database on coal resources
- Bureau of Land Management – responsible for coal leasing on both federal land and private land where mineral rights have been retained by the federal government
- Office of Surface Mining – regulates opencast mining and restoration
- Department of Labor
- Mine Health and Safety Administration
- Environmental Protection Agency.

A.3.9 Other government agencies also have roles in other parts of the coal fuel chain, including:

- DOE regulates the interstate transportation of electricity, administers research and development of clean coal technologies, and collects information on the coal and coal consuming industries, among other responsibilities not directly related to coal mining. Most of the research function of the former U.S. Bureau of Mines passed to the DOE.
- The Department of Transportation regulates the transport of coal and other commodities on railroads, trucks, and barges.

- The Department of Justice enforces all federal laws, including those related to coal mining and use.
- Other agencies administer and enforce the many other laws, rules, and regulations that apply very broadly to most industrial operations, including coal mine operations.

A.3.10 In addition, all states that have coal mining operations have regulatory agencies that administer coal mining and related federal laws and carry out other functions such as training and reemployment activities. In addition, some states, especially those with large coal reserves (for example, Ohio, Illinois, Kentucky, and Wyoming) have programs to publicize and promote the use of their coal. For example, in Ohio, the Ohio Coal Development Office, within the Ohio Department of Development, cofunds the development and implementation of technologies that can use Ohio's vast reserves of high-sulphur coal.

Australia

A.3.11 Australia has a three-tiered federal system of government: federal, state/territory, and local. In recent years, the federal government has relaxed or abolished many regulations affecting the coal industry. It has deregulated financial and foreign exchange markets, reduced taxes and charges, relaxed foreign investment guidelines, and removed export control powers on coal. Coal resources in Australia are managed by the state/territory governments.

A.3.12 The Department of Industry, Tourism and Resources, established by the federal government, operates in accordance with the constitution and legislation. Duties include supervision of the coal industry, taxation policies, environmental protection, and management of special funds for infrastructure construction.

A.3.13 Coal production in Australia is mainly concentrated in the States of NSW and Queensland each of which has established departments responsible for:

- planning mining areas in accordance with the distribution of coal reserves
- issuing exploration, development, and mining licenses
- collecting, analyzing, and disseminating relevant data
- management of mine employees' training plans
- provision of medical care insurance and establishing medical care centers
- providing infrastructure required for transporting coal to markets (railways and ports).

United Kingdom

A.3.14 The United Kingdom has a long history of coal mining during which the coal sector has experienced several changes including nationalization in 1947 and privatization in 1994. The current institutional arrangements are focused on the management of the relatively small, privately owned mining industry remaining after a period of mine closure and rationalization. The government attempts to balance energy needs, sustainable development, and environmental protection.

A.3.15 The following summarizes the roles and responsibilities of the national and local governments and associations relevant to the coal mining sector in the United Kingdom.

Department of Trade and Industry

A.3.16 This “federal” type agency oversees the coal industry through the Coal Policy Directorate under the Department of Trade and Industry (DTI). It was formed in February 2001 combining the former Coal and Coal Health Claims Units and is responsible for providing subsidies to coal mines to help them maintain economic viability, but the subsidy does not undercut the price of imported coal. The DTI is also responsible for the regulatory framework established by the 1994 Coal Industry Act and management of the residual liabilities of British Coal, including health and certain other employees’ liabilities.

Coal Authority

A.3.17 The Coal Authority was established under the Coal Industry Act of 1994 to undertake specific statutory responsibilities associated with:

- licensing coal mining operations in Britain
- handling subsidence damage claims
- dealing with property and historic liability issues, such as treatment of mine water discharges
- providing public access to information on past and present coal mining operations.

British Geological Survey

A.3.18 The British Geological Survey is a repository of coal resource information including plans, borehole records, and geological and geophysical information.

Environment Agency

A.3.19 The Environment Agency is the environmental protection regulatory and enforcement agency in the United Kingdom and is consulted by planning authorities on all mining applications.

Mineral Planning Authorities

A.3.20 In Britain, the framework of land-use planning is largely provided by the Town and Country Planning System. This aims to secure the most efficient and effective use of land in the public interest and attempts to reconcile the competing needs of development and conservation. It has an important role to play in contributing to the government's strategy for promoting sustainable development. Coal exploration and opencast and underground mining operations require planning permission before development can take place.

A.3.21 Land-use planning is the direct responsibility of local authorities in the United Kingdom. The Office of the Deputy Prime Minister has responsibility for the operation of the system in England. Each of these departments is also responsible for developing national planning policy guidance, including that for mineral development, within which local authorities are required to operate.

Mineral Planning Authority

A.3.22 The planning responsibilities of Mineral Planning Authorities (MPAs) are roughly divided into two:

- the formulation of policies and plans to guide future development (development plans) and
- regulating individual developments that are proposed through deciding planning applications and enforcing planning consents (development control).

A.3.23 Local governments prepare two levels of development plans that affect minerals:

- structure plans – general principles and policies for all forms of development
- minerals local plans – detailed policies governing mineral extraction.

A.3.24 The key aims of a minerals plan are to:

- balance through its policies the essential need for minerals against protection of the environment and local amenity
- make an appropriate provision for the supply of minerals and provide an effective framework within which the minerals industry may make planning applications
- set policies for the control of mineral working and associated development
- identify areas of possible future mineral working

- prevent unnecessary sterilization of resources by the use of safeguarding policies, including defining mineral consultation areas where appropriate.

A.3.25 Minerals local plans usually indicate areas in which mineral extraction might be acceptable and where proposals will normally be resisted. Applications that are in conformity with the local development plan, and that are acceptable in other respects, will normally be permitted, unless material considerations indicate otherwise. The planning system is, therefore, plan led. This helps to give certainty to both the minerals industry and local residents with respect to proposals for extraction.

A.3.26 In addition, the United Kingdom has several important associations that ensure that coal and coal utilization technologies continue to play a role in its energy mix and that the health, safety, and employment of miners are protected.

Administration of Coal Resources

United States

A.3.27 Mining rights relating to fossil fuels and other minerals are acquired under the Mineral Leasing Act of 1920, which empowers the Bureau of Land Management to grant leases for the development of deposits of coal and other leasable minerals on public lands. The Mineral Leasing Act establishes qualifications for mineral lessees, sets out maximum limits on the number of acres of a particular mineral that can be held by a lessee, and prohibits alien ownership of leases except through stock ownership in a corporation. While all federal mineral leases require the payment of annual rentals and production royalties to the United States, the terms and conditions of the leases vary. There is also extensive private ownership of coal, mostly in the eastern United States.

A.3.28 The statutory and regulatory requirements relating to federal coal leases differ somewhat from those relating to other solid minerals. The coal leasing provisions under the Mineral Leasing Act were substantially amended (Federal Coal Leasing Amendments Act of 1976), due to the few federal coal leases that were in production at that time and to the widespread speculation in federal coal leases that was occurring as investors waited for their undeveloped leases to increase in value.

A.3.29 Federal coal is leased competitively, in infrequent lease sales held by the Bureau of Land Management (BLM). Prior to a sale, BLM determines the fair market value and maximum economic recovery of the tracts offered for lease. No bids lower than the fair market value are accepted. Coal leases provide for the payment of annual rentals and of a royalty of not less than 12 percent of the value of coal removed from a surface mine or 8 percent of the value of coal removed from an underground mine. The terms of a federal coal lease are subject to readjustment at the end of the first 20-year period of the lease and, if the lease is extended, at the end of each 10-year period thereafter.

A.3.30 The 1976 coal lease amendments require lessees to have deposits in production within 10 years or forfeit the leases and lose eligibility for additional leases. Coal leases

can be combined into “logical mining units” for more efficient development. Coal mining operations (on both federal and private lands) remain regulated by the Office of Surface Mining (OSM) or federally approved state OSM offices under the Surface Mining Control and Reclamation Act of 1977.

Australia

A.3.31 Coal resources in Australia are managed by the state/territory governments. Conditions for mineral exploration and development in Australia are generally set out in state/territory mining acts and related regulations, which specify the procedures to be followed for coal exploration and exploitation. Other state/territory legislation covers a broad range of issues including safety, employment, environment protection, royalties, and transport within Australia.

A.3.32 The laws and regulations relating to exploration and exploitation in NSW illustrate the administrative mechanism introduced by the Mining Act 1992, which encompasses exploration licenses, assessment leases, mining leases, consolidation of mining leases, authorities generally, mineral claims, protection of the environment, power of entry, and royalty. The law is administered by the state’s department of mineral resources.

Royalty System in New South Wales

A.3.33 A mineral royalty is the price charged by the Crown for the transfer of the right to extract a mineral resource. The royalty rate is prescribed in legislation. It is the role of the Royalty and Statistics Branch of the Department of Mineral Resources (DMR) to administer the legislation relating to mineral royalty, collect the royalty due, disburse royalty to private mineral owners, and maintain a mining statistics database. The collection of mining royalties is based on self-assessment. It is the responsibility of the mining leaseholder to calculate and promptly lodge the royalty return. All coal recovered in NSW is subject to payment of a coal royalty. Two types of coal royalties apply: prescribed royalty and super royalty.

A.3.34 Prescribed royalty is A\$1.70 per ton, payable monthly (in arrears) on coal recovered. However, payment of the prescribed royalty is deferred until such time as the coal is disposed of or sold. For the purpose of the monthly prescribed royalty payment, the tonnage of coal is reduced by a nominal moisture allowance (7 percent in the southern coalfields, 5.5 percent elsewhere).

A.3.35 Some coal leases mining coal by opencast methods attract an additional super royalty at the rate of A\$0.50 per ton. This super royalty is additional to the prescribed coal royalty and is calculated on the same basis.

A.3.36 Unpaid royalty amounts incur an interest charge that is added to the outstanding amount and must be paid. The interest rate is 1.5 times the bank’s unsecured personal overdraft rate or any other rate that the minister may from time to time determine. In addition to interest penalties, the legislation provides for fines for offenses relating to returns, the provision of information, and access to records. For example, under the

Mining Act 1992, if false or misleading information is furnished or lodging of royalty returns on time was failed, the regulations specify a maximum penalty of A\$11,000 for a corporation or A\$5,500 for an individual.

United Kingdom

A.3.37 The United Kingdom's coal resources are managed by the Coal Authority (CA), which issues mining leases and operating licenses to suitable coal mining applicants.

A.3.38 Although access to coal is granted by the CA, local authority planning consent must be obtained and consultations made with the Environment Agency before proceeding with exploration or development.

A.3.39 Because of the high cost of accessing deep coal, poor market conditions, a protracted local authority land-use planning process, and the likelihood of strong public objection to any coal mining proposal, there is limited private interest in investing in coal exploration and developing new underground coal mining capacity in the United Kingdom. Local authorities are reluctant to agree to opencast schemes and invariably opt for a public enquiry, which leads to further delays, costly preparation, and often failure of the application.

A.3.40 The concept of the CA as the single custodian of coal resources and their exploitation may be a useful model for China, but such an organization in China would also need provincial offices because of the greater size of the country.

Approval Procedures for Coal Mine Exploration and Development

United States

A.3.41 Surface mining operators must comply with a host of laws and regulations in the design of surface and underground mines. These apply to design factors related to miners' health and safety, subsidence, environmental protection, and other factors. For example, soil and prevailing climatological conditions prior to mining have to be considered, because the land has to be returned to approximately the same physical contour and to a state of productivity equal to or better than the premining condition. Wildlife habitats cannot be permanently disrupted, and archeological resources must be protected. The principal federal surface mining law sets forth 25 reclamation requirements for operators to meet, including mandates for public hearings and procedures for obtaining permits. To make certain that lands being mined will be restored, the law requires companies to post bonds, as high as US\$10,000 per acre, to cover reclamation.

A.3.42 Coal mining is one of the most extensively regulated industries in the United States. As long as 10 years can elapse between the start of planning a mine and mining the first ton of coal. The process begins with a mining company providing detailed information about its planned activities, including how the coal will be mined, how the land will be reclaimed, how the mine will affect the quality and quantity of surface and

underground water bodies, how the coal will be transported from the mine, and all related impacts.

Suitable Lands for Coal Leasing

A.3.43 Not all public lands are available for coal exploration or leasing. There is a rigorous land-use planning process through which all public lands are reviewed for potential coal leasing. Requirements for the land-use plan include multiple use, sustained yield, protection of critical environmental areas, application of specific unsuitability criteria, and coordination with other government agencies. There are four specific land-use screening steps that are unique to developing land-use planning decisions for federal coal lands:

- identification of coal with potential for development
- determination if the lands are unsuitable for coal development
- consideration of multiple use conflicts
- surface owner consultation.

Requirements and Limitations for Obtaining a Federal Coal Lease

A.3.44 To be qualified for a federal coal lease, one must be a citizen of the United States; or an organization under the laws of the United States, or of any states thereof, including a company or corporation operating a common carrier railroad; or a public body including municipalities. Aliens may hold interests in leases only by stock ownership in U.S. corporations holding leases and only if the laws of their country do not deny similar privileges to citizens of the United States—that is, reciprocity is required.

A.3.45 In addition to these general qualifications, one must also comply with the following special leasing qualifications: The aggregate acreage in leases and applications in which one can hold an interest, directly or indirectly, cannot exceed 46,080 acres in any one state and no more than 100,000 acres in the United States. One may not acquire any other mineral leases under the Mineral Leasing Act of 1920, as amended, if one holds or has held a federal coal lease for 10 or more years that has not produced commercial quantities of coal.

A.3.46 A logical mining unit (LMU) is a concept that allows the lessee or operator to consolidate the diligent development and continued operations requirements for all the federal leases and other coal tracts within the boundaries of a mine. The acreage of both federal and nonfederal lands within an LMU cannot exceed 25,000 acres. An LMU provides for continuity in management of the coal resource, whenever the geologic characteristics of a coal seam cross property boundaries. LMUs have been defined as an area of land in which the coal can be developed in an efficient, economical, and orderly manner as a unit with due regard for conservation of the coal and other resources. Formation of an LMU requires an application and approval by the BLM.

Competitive Leasing Process

A.3.47 The Federal Coal Leasing Amendments Act of 1976 requires that all public lands available for coal leasing be leased competitively. Once the BLM accepts an application, the agency begins either an environmental analysis (EA) or environmental impact statement (EIS). When a draft version of the EA or EIS has been prepared, the BLM seeks public comment on the proposed sale. At the same time, the BLM will also consult with other appropriate state, federal, and Native American government agencies.

A.3.48 Preparations for the lease sale start with the BLM formulating and estimate of the fair market value of the coal. This number is kept secret and is used to evaluate the bids received during the sale.

A.3.49 Sealed bids are accepted prior to the date of the sale and are publicly announced during the sale. The winning bid will be the highest one meeting or exceeding the coal tract's fair market value, assuming that all eligibility requirements are met and the appropriate fees and payments are attached (at a minimum, this amounts to the first year's annual rental payment and one-fifth of the amount bid).

A.3.50 A federal coal lease grants the right to explore for, extract, remove, and dispose of some or all of the coal deposits that may be found on the leased lands. Coal leases are granted on the condition that the lessee will obtain the appropriate permits and licenses from the BLM, the OSM, and any affected state and local governments.

A.3.51 The BLM may assign a lease in whole or in part to another entity that is qualified to hold a federal coal lease. The rights of the entity receiving the lease, however, will not be recognized by the BLM until the assignment is approved, and the original lessee remains responsible for all obligations of the lease until the approval occurs. Under certain circumstances, an exchange of coal leases may be allowed for the purposes of compensation, or when it is in the public interest.

A.3.52 Before the BLM issues a coal lease, the lessee must furnish a bond in an amount determined by the agency to ensure compliance with all lease terms and conditions. At a minimum, a bond is required that covers any remaining balance of the bonus bid, as well as one year of advance rental and one-quarter year of advance royalties. In addition, the Surface Mining Control and Reclamation Act of 1977 requires sufficient bonding to cover anticipated reclamation costs. This bond is submitted to the OSM reclamation enforcement or the state regulatory office. The BLM may require a change in bond amount, either higher or lower, at any time the agency believes it is warranted.

A.3.53 The annual rental rate for coal leases is US\$3 per acre. After the lease is issued, rentals must be received by the Department of Interior's Minerals Management Service on or before the lease anniversary date to prevent statutorily required automatic termination of the lease. This generally requires mailing of the annual payment at least a week to 10 days in advance of the anniversary date to ensure its timely receipt.

Australia

A.3.54 A coal title system has been developed, mainly because the coal resources are generally the property of the Crown (authority delegated to the NSW state government) and because their locations are largely well known. It is, therefore, in the government's interest to ensure that the potential resources are allocated in a manner that maximizes utilization, and therefore the return to the people of NSW. The Resource Planning and Development Division provides advice and assistance to title applicants and fast turn-around times on applications. It aims to process more than 85 percent of all exploration license applications within 10 weeks and to grant more than 90 percent of mining lease applications within two months of obtaining development consent. Performance is set to improve even further with the current introduction of a new computerized Titles Administration System.

A.3.55 With respect to coal, the Mining Act provides for the:

- exploration license
- assessment lease
- mining lease.

Exploration License

A.3.56 An exploration license is a title granted by the NSW government to individuals and companies that wish to explore for minerals. Applicants for an exploration license must demonstrate to the DMR that they have the financial and technical resources to carry out an exploration program. License holders are required to spend a specified amount of money on exploration.

A.3.57 An exploration license does not permit mining nor does it automatically follow that a license holder will be permitted to mine in the future even if a discovery is made.

A.3.58 An exploration license may be granted for a period not exceeding five years. The license may be renewed for further periods each not exceeding five years. An exploration license is generally granted and renewed for terms of two years.

Assessment Lease

A.3.59 An assessment lease is a relatively new title in NSW. It was introduced by the Mining Act 1992 when that act commenced on August 21, 1992. An assessment lease is an intermediate title covering the period between an exploration license and a mining lease.

A.3.60 An assessment lease can be applied for by the holder of an exploration license, after most of the exploration work is finalized and where that work has located a mineral deposit that is not presently viable for mining development. This may be due to general economic conditions, insufficient selling price for the mineral, lack of current markets for the mineral, need for development of improved refining processes, and so forth. The

assessment lease allows a company or person to continue to have a title to the mineral deposit concerned while further studies or appraisals of the above issues are made. During this time, layouts and mine plans might be further developed and environmental impact work addressed.

A.3.61 An assessment lease may be granted for a period of up to five years and renewed for further periods of up to five years.

Mining Lease

A.3.62 A mining lease is designed to allow the holder to mine or to carry out mining projects. The DMR will not grant a mining lease to mine, unless it is indicated that an economically minable mineral deposit exists. A deposit is usually located and outlined by exploration on an exploration license. The mining lease applicant must submit details of proposed mine development.

A.3.63 Mining leases are generally granted for a maximum term of 21 years although many leases are now granted for a shorter period. There is provision to grant leases for longer than 21 years in special cases. The lease is renewable.

A.3.64 There are conditions attached to the mining lease that require the leaseholder to rehabilitate the land. The land is usually returned to its premining state or made suitable for another land use.

A.3.65 There is no maximum area for a mining lease. However, if it is considered too large one may be requested to justify the size of the area sought.

A.3.66 There is no minimum area for a mining lease, but if one only requires an area of 2 hectares or less, it may be preferable to acquire a mineral claim.

Security Deposit System

A.3.67 To ensure that land is fully rehabilitated after opencast mining, operators must lodge a bond to ensure compliance. The amounts of the security deposit are based on performance, subject to regular review.

A.3.68 The objectives of the security deposit system are:

- to ensure the rehabilitation of all surface disturbance, caused by exploration or mining, to a stable and permanent land form that is commensurate with the surrounding land fabric and suitable for an agreed subsequent land use
- to ensure the rehabilitation of environmentally sensitive lands receives special and appropriate environmental management and rehabilitation procedures to maintain their environmental integrity
- to ensure compliance with the conditions of titles and approvals

- to minimize the financial liability to the state from mining and exploration operations by providing incentives for progressive rehabilitation.

A.3.69 Security deposits are held until rehabilitation has been carried out to the satisfaction of the DMR. In the event of titleholders failing to meet their obligations, the security deposit may be forfeited and the DMR can apply the funds to the rehabilitation of the site.

A.3.70 Security deposits must be sufficiently high so as to minimize the financial risk to the state if a titleholder defaults. The security may be increased progressively, in parallel with incentives on the operator to reduce the disturbed area, as mine development proceeds.

A.3.71 In the case of old mining areas, it may be preferable to encourage renewed mining and processing activity and progressively repair the effects of past mining, rather than have the state assume the burden of rehabilitation.

A.3.72 Security deposits are calculated prior to the grant of a mining lease and also prior to approval for opencut mining operations. These security deposits are reviewed if the titles are transferred or upon application to extend or vary opencut mining operations. Security deposits can also be reviewed at the titleholder's request. It is now the DMR's policy that all security deposits are reviewed at least every four years.

A.3.73 In the case of a security deposit calculation for the grant of a mining lease, the major source of information is the mining lease application and any supporting documentation, such as an EIS. If a security deposit is reviewed on an annual basis, or so that a transfer of the title can occur, or at the titleholder's request, the Annual Environmental Management Plan Report for that mining operation is used as the principal source of the information for the calculation. Security deposits are calculated by applying standard rehabilitation cost rates to areas according to the categories of disturbance.

Exploration Licenses and Assessment Leases

A.3.74 Security deposits are calculated for the grant of an exploration license or an assessment lease. These security deposits are reviewed when titles are transferred, or at the titleholder's request, or on an annual basis if agreed to by the DMR. Security deposits held against exploration licenses and assessment leases may be forfeited if the titleholder does not meet the obligations to rehabilitate disturbed lands or fails to provide an exploration relinquishment report.

A.3.75 In the case of coal exploration titles a standard security of A\$10,000 is generally required. However, if the exploration is to occur under a lake (body of water) A\$20,000 is the standard figure. Exploration in sensitive areas or using nonstandard exploration techniques may require a higher security deposit.

Administration of Mining Health and Safety

United States

A.3.76 The MSHA administers the Federal Mine Safety and Health Act. The act requires all mines to be registered with MSHA and for MSHA inspectors to inspect each surface mine at least twice a year and each underground mine at least four times a year (seasonal or intermittent operations are inspected less frequently) to determine whether there is compliance with health and safety standards or with any citation, order, or decision issued under the Mine Act, and whether an imminent danger exists. If violations of safety or health standards are found, inspectors will issue citations to the mine operators. During fiscal year 2000, MSHA conducted approximately 20,000 regular mandatory inspections at the nation's 15,000 surface and underground mines. Closure orders are issued for mine conditions that are considered imminent dangers, along with violations that have not been corrected in the time allowed by federal inspectors. Companies and individuals are also criminally prosecuted under the Mine Act. Since 1990, over 350 companies and individuals have been convicted of violations of the Mine Act in criminal cases. Violation of standards carries a penalty of up to US\$55,000.

A.3.77 MSHA performs other mandatory functions including:

- investigating mine accidents, complaints of retaliatory discrimination filed by miners, hazardous condition complaints, knowing or willful (criminal) violations committed by agents of mine operators, and applications for modification of mandatory safety standards
- developing improved mandatory safety and health standards
- assessing and collecting civil monetary penalties for violations of mine safety and health standards
- reviewing for approval mine operators' mining plans and education and training programs.

A.3.78 Other activities that support the mandates of the Mine Act include:

- maintaining the National Mine Health and Safety Academy to train inspectors, technical support personnel, and mining industry personnel
- approving and certifying certain mining products for use in underground coal and gassy metal and nonmetal mines to ensure they do not cause a fire or explosion
- providing technical assistance to mine operators in meeting the requirements of the Mine Act

- providing assistance to mine operators in improving their education and training programs
- cooperating with states in the development of mine safety and health programs
- making grants to states in which mining takes place
- overseeing rescue and recovery operations.

A.3.79 The act strengthened earlier coal mining law and brought all (metal and nonmetal) miners under the same general protections as those enjoyed by coal miners. The act also provided for closure of mines in cases of imminent danger to workers or failure to correct violations within the time allowed, greater involvement of miners and their representatives in processes affecting workers' health, and tougher civil monetary penalties for safety or health violations by mine operators. It also established stringent mine ventilation, methane, coal dust, electrical, and roof control standards to curb mining disasters.

A.3.80 The 1977 Mine Act is recognized as one of the most successful worker protection laws enacted by the U.S. Congress. In the 1960s, prior to the implementation of the 1969 Mine Act, the fatality incidence rate per 200,000 man-hours averaged 0.22. In the first 20 years after the 1969 Mine Act was passed, the fatal incidence rate was reduced from 0.22 to 0.05 and steadied at that level, mainly due to the increased use of contractors.

A.3.81 MSHA's Coal Mine Safety and Health Division enforces the law and the regulations at underground and surface coal mines. Health and safety regulations developed and enforced by MSHA cover numerous hazards, including those associated with:

- exposure to respirable dust, airborne contaminants, and noise
- design, operation, and maintenance requirements for mechanical equipment, including mobile equipment
- roof falls, and rib and face rolls
- flammable, explosive, and noxious gases and dust and smoke
- electrical circuits and equipment
- fires
- hoisting
- access and egress.

Occupational Health

A.3.82 Probably the most important coal mine occupational health law is the Black Lung Benefits Act (BLBA), which is actually a part of the Federal Mine Safety and Health Act of 1977. This law provides monthly payments and medical treatment to coal miners

disabled from black lung disease (pneumoconiosis) arising from employment in coal mines. It also provides for payments to certain family members of miners who died from the disease or are totally disabled because of it. The Employment Standards Administration's Office of Workers' Compensation Programs, Division of Coal Mine Workers' Compensation, administers the act.

A.3.83 Under the BLBA, each coal mine operator is required to pay an excise tax, based on the operator's tonnage and price of coal sold, to support payment of benefits to miners under the act and the cost of administering the act. The current rate is US\$1.10 per ton for underground-mined coal and US\$0.55 for surface-mined coal, subject to a cap of 4.4 percent of the sales price. In addition, operators must provide for the payment of benefits to miners, either directly or through insurance, when they are the responsible employer of the miners. This is done through the Black Lung Disability Trust Fund, which pays the cost of black lung claims: (a) where the miner's last coal mine employment was before January 1, 1970; or (b) where no responsible coal mine operator has been identified in claims where the miner's last coal employment was after December 31, 1969; or (c) where the responsible coal mine operator has defaulted on the payment of such benefits.

A.3.84 For purposes of determining responsibility for paying benefits, a coal mine operator includes: (a) any owner, lessee, or other person who operates, controls, or supervises a coal mine or preparation plant; or (b) any independent contractor performing services or construction at a mine; or (c) companies transporting coal from mines to preparation plants.

A.3.85 The basic monthly benefit as of January 1, 2001, for a totally disabled miner or his or her surviving spouse was US\$500.50 per month, which could be increased to a maximum of US\$1,001 per month for claimants with three or more qualified dependents. Benefit payments are reduced by the amounts received under state workers' compensation awards and adjusted periodically according to the percentage increase of federal pay rates.

A.3.86 Medical payments are limited to the treatment of conditions directly related to black lung disease, and only totally disabled former miners can qualify for this benefit (which covers certain medical, surgical, and other expenses, such as hospital and nursing care, rehabilitation services, and drug and equipment charges).

Australia

A.3.87 There are no federal laws and regulations specifically for coal mining. They are all legislated on the state level, and those from NSW are used as examples below.

A.3.88 The Occupational Health and Safety Act (OH&S Act) is the primary legislation for the regulation of occupational health and safety in NSW. It applies to all industries, including the mining industry. The objectives of the OH&S Act are stated to be:

- to secure the health, safety, and welfare of persons at work

- to protect persons at the place of work (other than persons at work) against risks to health or safety arising out of the activities of persons at work
- to promote an occupational environment for persons at work that is adapted to their physiological and psychological needs.

A.3.89 If there is an inconsistency between a provision of the OH&S Act and a similar provision of the mining legislation, the OH&S Act prevails.

A.3.90 The Mines Legislation Amendment (Mines Safety) Act 1998 (amending both the Mines Inspection Act 1901 and the Coal Mines Regulation Act 1982) introduced the following important provisions:

- creation of investigators who have a specialist role separate from inspectors
- development of an independent unit that investigates fatal accidents. This will prevent conflict that may arise from inspectors investigating matters in which they have had a previous role
- establishment of the position of mine safety officers, who will have expertise in spontaneous combustion, ventilation, or auditing mine safety plans (they also have investigative powers)
- creation of alternate inquiry provisions for investigation of more serious incidents or safety and health issues in mines; this includes provision for a board of inquiry to conduct special investigations.

A.3.91 An Investigation Unit was established in 1999 by the NSW government to improve mine safety in the state, under Mines Legislation Amendment (Mines Safety) Act 1998. The unit investigates all deaths in mines, gas and dust explosions, and inrushes of water and other materials into mine workings. The unit has the power to examine the role of the mine where an accident has occurred and suppliers and manufacturers and any other people relevant to the accident.

A.3.92 To improve mine safety, the unit:

- proposes new standards in safety protocols and procedures
- conducts and assists with investigations
- provides training to departmental staff
- takes part in legal proceedings
- gives information to industry and provides feedback.

A.3.93 The unit is autonomous within the DMR and reports directly to the director-general on all matters relating to any investigation. It is separate from the DMR's Inspectorate. It is removed from the normal operational matters of the DMR so it is able

to conduct its activities without conflict of interest. Every report of an investigation is submitted to the Assessment and Review Committee where prosecution can be recommended. The director-general will decide whether a matter will be subject to legal proceedings. These initiatives have led to improvements in the standards of investigations, including a number of successful prosecutions.

A.3.94 Under legislation, the mine manager must inform an inspector of a reportable mine event. When the DMR is notified, it needs particular information that is listed on an Oral Notification Checklist, which can be downloaded from the DMR's website.

A.3.95 In July 1998, amendments to the Mines Inspection Act 1901 and the General Rule 1994 passed through state parliament. The Mines Inspection Amendment Act updated the previous legislation to make it relevant for modern mining practices and responsibilities, and includes the following changes:

- provisions that ensure that the act conforms with the standards of International Labor Organization Convention No. 176 "Safety and Health in Mines" (such as the undertaking of risk assessment on mine sites)
- inclusion in the act of the positions of general manager and production manager, with statutory obligations under the act
- requirement for managers to undertake ongoing training to maintain their competencies.

A.3.96 The Investigation Regulation supports initiatives taken by the DMR for the administration of safety in coal mines through the Mines Legislation Amendment (Mines Safety) Act 1998. It encourages the involvement of all parties in safety matters and also creates a clear structure for the undertaking of investigations. The regulation prescribes provisions to:

- require inspectors and others to produce certificates of authority in certain circumstances
- specify the form of words to be used by inspectors and others, when exercising certain powers under the act
- detail certain accidents and dangerous occurrences in mines that must be reported to the director-general of the DMR
- specify certain functions of inspectors and others with respect to accidents or dangerous occurrences in mines
- require that the terms of reference of a board of inquiry into an accident, dangerous occurrence, practice or matter in a mine be publicly available
- specify matters associated with potential appointees to the boards of inquiry.

A.3.97 The “Enforcement of Health and Safety Standards in Mines,” which was released by the DMR in January 1999, provides guidance on the principles that the DMR applies in enforcing mining legislation on health and safety. The policy was developed through consultation with all parties in the industry. The document sets out the context and principles of enforcement, industry’s responsibilities, the DMR’s approach to assessment and investigation, self-assessment by the industry, and prosecution policy and guidelines.

A.3.98 The effectiveness of mining safety legislation as applied in Australia is demonstrated by a relatively low number of fatalities, three in 1999–2000, and a steady decline in lost-time injuries. In 1988–89 the rate was 191 injuries per million hours worked, whereas in 1998–99 the rate was 39, and in 1999–2000 the rate decreased to 34.

A.3.99 The Coal Mine Health and Safety Act 2002 secures the health, safety, and welfare of persons in connection with current and former coal operations in NSW using a risk-management-based approach. Duties relating to health, safety, and welfare at coal operations include:

- Duties of mine owners include nominating the operator of a coal operation and giving health and safety information.
- Duties of operators of coal operations include to: (a) prepare the health and safety management system (no mining permitted without a health and safety management system); (b) ensure compliance with the health and safety management system, information to be supplied to chief inspector and industry check inspector; (c) prepare one or more major hazard management plans; (d) prepare a management structure; (e) prepare a contractor management plan; (f) ensure contractors’ familiarity with systems; and (g) prepare an emergency management system (no mining without an emergency management system) and notify high-risk activities.
- Duties of employees include: (a) compliance with the health and safety management system for the coal operation; (b) following the operator’s procedures for emergencies as set out in the emergency management system for the coal operation; (c) informing the operator of any circumstances that the employee considers may lead to a loss of control of a major hazard; and (d) reporting to his or her immediate supervisor any situation that the employee believes could present a risk to health and safety and that is not within the employee’s competence to control. If the employee’s supervisor is not immediately available, the employee must instead immediately report to another senior person at the coal operation.

A.3.100 The above introduces basic principles that are not presently evident in China’s mine safety procedures.

United Kingdom

A.3.101 The Health and Safety Commission (HSC) and its operational arm, the Health and Safety Executive (HSE), advise on, promote, and enforce health and safety legislation on behalf of the government. The HSC itself is a multipartite body comprising representatives from employers, trade unions, consumer interests, local government, and so on. It has a number of advisory committees, including one for deep mines, whose main purpose is to advise the HSC on the adequacy and practicability of its proposals. The advisory Committees also provide a mechanism for resolving differences without prejudicing health and safety at mines.

A.3.102 In recent years development of safety legislation has moved from being disaster driven to an approach that requires employers and managers to identify hazards, assess risks, and take steps to avoid or control them, which is to prevent accidents and incidents rather than react to them. The underground coal mining industry in the United Kingdom is now among the safest in the world with only one fatal accident in a coal mine since April 1999, when a man was killed by a fall of rock.

Role of the Mining Regulator

A.3.103 The HSC has a Mines Inspectorate whose role is to inspect mines and to advise managers and others, not only on compliance with the law but also on what they consider to be good practice. They also investigate accidents and incidents in mines. Mines inspectors have a wide range of legal powers they can use to enforce compliance including, if necessary, through the judicial system. They have powers to immediately stop work where they believe there is an imminent risk to health or safety, and powers to require improvements in other circumstances.

A.3.104 Mines inspectors in the United Kingdom are only recruited after they have spent several years in a senior management position at a large coal mine. Inspectors are completely independent of the mines they inspect, and their salary levels are similar to managers of large mines.

A.3.105 A mining inspector will visit a large coal mine about 20 times a year to cover the whole range of activities at the mine. Electrical and mechanical engineering inspectors both make about 10 inspections at each large coal mine. Smaller mines and low-hazard mines are inspected far less frequently. Inspectors have a range of responses to breaches of the law ranging from verbal warnings to written warnings, cautions, enforcement notices or citations, withdrawal of permissions and, ultimately, prosecution.

A.3.106 All inspection reports are entered onto a national database that inspectors can access and search at any time to ensure consistency and also monitor trends.

Health and Safety Management Legislation

A.3.107 Current British health and safety legislation places duties on employers, who include mine owners, to ensure that they have in place safe systems of work. However, modern legislation does not prescribe exactly what they should do, but what they should achieve. For example, the Management and Administration of Safety and

Health at Mines (MASHAM) Regulations require mine owners to ensure that their mines are worked in accordance with the provisions of health and safety law. In other words, not only do owners have to comply with their legal duties, but they also have to have in place procedures to ensure that people who work in their mines comply with the legal duties placed on them. Mine owners, therefore, have a legal incentive to ensure the safety and health of people who work in their mines. The mine owner has to appoint a sole manager who is suitably qualified and competent before a mine can be worked.

A.3.108 Coal mine managers have to hold a “First Class Certificate of Competency.” To obtain a manager’s certificate they need to have had several years of practical experience in coal production and several years as a supervisor. They also need to hold a recognized mining academic qualification and to have passed an examination in health and safety law.

A.3.109 The MASHAM Regulations also require owners and managers jointly to establish suitable management structures by:

- looking at the conditions that can affect the way the mine is worked
- identifying the hazards
- assessing the risks that arise from those hazards
- deciding what measures are needed to avoid or control those risks
- determining how many people they need to manage, supervise, and inspect operations to implement the risk control measures, what skills they need, and how they intend them to work together as a team.

A.3.110 Supervisors responsible for mining operations are also responsible for the health and safety of those they are supervising. Senior members of the management structure are responsible for ensuring supervisors are properly implementing the risk control measures.

A.3.111 Workers have relatively few legal duties, and these mainly focus on complying with specific parts of the law and with any health and safety rules or instructions, and reporting danger. They also have legal duties to cooperate with employers on health and safety, and an overriding duty is not to put themselves or others at risk through their acts or omissions.

A.3.112 In summary, the law requires that:

- Mine owners should have a clear health and safety policy.
- There should be a mine management structure that contains a sufficient number of competent and suitably qualified people who are capable of implementing that policy and ensuring compliance with health and safety law.

- There should be clear procedures and methods of work.
- The policy, management structure, and procedures should be monitored to check that they are working effectively.
- They should be audited and reviewed, periodically or when a significant change occurs.

A.3.113 In the United Kingdom, some private mining companies have realized that the investment needed to achieve an increase in market share to generate extra profits is much greater than the investment to cut their accidental losses by a similar amount. They have embarked on programs to reduce accidents with the aim of minimizing losses and eliminating personal injuries and ill health altogether. While the business economics of state-owned enterprises are somewhat different, the underlying principles remain the same, and it is in the interests of the state to take similar steps to ensure that those who run its mines take steps to prevent accidental loss. The experience in the United Kingdom has been that reform of safety legislation is best achieved by government working with all sides of the industry to develop workable proposals that encourage everyone within the industry to put health and safety first, by taking responsibility for their own health and safety, and for that of anyone who might be affected by their actions. However, changing the attitudes toward health and safety of those who work in the industry is a long-term aim, and it cannot be achieved overnight.

Occupational Health

A.3.114 As in the United States, pneumoconiosis provisions had been made in U.K. mining legislation. However, other debilitating and chronic diseases were subsequently identified as associated with coal mining and led to a massive legal claim against the former British Coal Corporation (BCC) following privatization of the U.K. coal industry. Following a mass legal action, the courts ruled that in the past, BCC had been negligent in exposing miners to hazards that could have been avoided had best practice measures available at the time been adopted.

A.3.115 As a consequence, the U.K. government's DTI Coal Policy Directorate is now responsible for operating major personal injury compensation schemes for:

- respiratory disease (chronic bronchitis and emphysema) resulting from the dusty conditions
- vibration disease (hand arm vibration syndrome) caused by using vibrating tools.

A.3.116 Approximately US\$2.6 million a day is being paid in compensation. More than 371,500 claimants have registered over both schemes, and it is estimated that the government will spend about US\$10 billion in total. The potential for massive retrospective collective claims by miners is a major liability and an important issue for governments to consider when planning privatization, and also for prospective investors in existing mines to be aware of.

Environmental Management

United States

A.3.117 The U.S. Environmental Protection Agency (EPA) provides leadership in the nation's environmental science, research, education, and assessment efforts. EPA works with other federal agencies, state and local governments, and American Indian tribes to develop and enforce regulations under existing environmental laws. EPA is responsible for researching and setting national standards for a variety of environmental programs and delegates to states and tribes responsibility for issuing permits and monitoring and enforcing compliance. Where national standards are not met, EPA can issue sanctions and take other steps to assist the states and tribes in reaching the desired levels of environmental quality. The agency also works with industries and all levels of government in a wide variety of voluntary pollution prevention programs and energy conservation efforts.

A.3.118 Other federal laws with significant impact on mining are the Clean Air Act, the Clean Water Act, and the National Environmental Policy Act 1969, which establishes policy, sets goals, and provides means for carrying out the policy. In addition, each state where surface mining occurs has its own set of laws and regulations. Beyond the specific requirements of the federal laws already noted, many other legislative acts affect some or all surface mining activities in the United States. These are listed below to illustrate the complexity of issues involved:

- American Indian Religious Freedom Act of 1978
- Antiquities Act of 1906
- Archeological Historical Preservation Act of 1974
- Archeological Salvage Act
- Bald Eagle Protection Act of 1969
- Endangered Species Act of 1963
- Fish and Wildlife Coordination Act of 1934
- Forest and Rangeland Resources Planning Act of 1974
- Historic Preservation Act of 1966
- Migratory Bird Treaty Act of 1918
- Mining and Minerals Policy Act of 1970
- Multiple Use – Sustained Yield Act of 1960
- National Forests Management Act of 1976
- National Trails System Act

- Noise Control Act of 1976
- Resource Conservation and Recovery Act
- Safe Drinking Water Act of 1974
- Soil and Water Resources Conservation Act of 1977
- Wild and Scenic Rivers Act
- Wilderness Act of 1964.

A.3.119 A Rural Abandoned Mine Program (RAMP) was designed to restore agricultural land that has been disturbed by strip mining. The program is carried out by the Department of Agriculture's (USDA's) Natural Resources Conservation Service (NRCS) at a current cost of about US\$10 million per year. The total federal abandoned surface mining reclamation efforts currently exceed US\$110 million per year. Critics contend that the RAMP is inefficient and duplicates other federal and state reclamation activities. Proponents contend that the effort has been underfunded and thus unable to fulfill its goals and to realize potential efficiencies.

A.3.120 It is authorized for the purpose of reclaiming the soil and water resources of rural lands adversely affected by past coal mining practices. Eligible land includes nonfederally owned, abandoned, or inadequately reclaimed coal mined land (or land and water) affected by coal mining (if it was mined before August 3, 1977) if there is no continuing reclamation responsibility by the mine operator or the state. It cannot be under lease for coal mining.

A.3.121 There were approximately 1.1 million acres of abandoned coal-mined land needing reclamation in 1977. The NRCS, formerly the Soil Conservation Service, administers the program, and funding is provided from money deposited in the Abandoned Mine Reclamation Fund. The program provides technical and financial assistance to land users who voluntarily enter into 5- to 10-year contracts for reclamation of up to 320 acres of eligible abandoned coal-mined lands and waters. The land user with NRCS technical assistance involved prepares a reclamation plan.

A.3.122 All active coal mining operators pay into the Abandoned Mine Reclamation Fund at a rate of 35 cents per ton of coal produced from surface mining and 15 cents per ton of coal produced by underground mining. The fees are deposited in an interest-bearing fund, which is used to pay reclamation costs of Abandoned Mine Land (AML) projects. Expenditures from the fund are authorized through the regular congressional budgetary and appropriation process. In addition to this federal program, over 20 states now have their own reclamation laws, regulations, enforcement authority, and abandoned land programs. They are eligible to receive their full 50 percent allocation of total AML fee collections. Those states that do not have their own agencies receive most of their funding from the OSM. RAMP's expenditures are dwarfed by these other activities.

A.3.123 In directing the states to enforce the federal surface mining law, Congress recognized that effective coal mining regulation must take into account local conditions and problems unique to certain areas. To a large degree, that process has worked well. Where problems exist, enforcement actions have been necessary against violators. In fact, extensive enforcement efforts are undertaken by federal and state agencies to ensure compliance with all applicable requirements.

Australia

A.3.124 Various federal acts establish environmental protection measures that apply to mining developments. Specific environmental laws relating to mines are enacted at the state (provincial) level. For example, the Mining Act 1992 of NSW requires that acceptable environmental and rehabilitation outcomes be developed with respect to:

- prevention of air, water, and noise pollution
- protection of flora, fauna, and habitats, in particular protection of threatened species
- recognizing and preventing impact on Aboriginal, archaeological, historical, and geological sites
- effect on scenic and other amenities
- ensuring safety of the public, stock, and fauna
- progressive site rehabilitation, including a conceptual closure plan and contamination management, to achieve an agreed postmining land use.

A.3.125 The NSW government requires companies holding titles under the Mining Act 1992 to lodge security bonds to ensure that the cost of rehabilitation of mining will be met by the miner rather than through public funding. Security deposits are a prescribed condition of exploration and mining titles and are referred to in Parts 3, 4, and 5 of the Mining Act 1992 in relation to exploration licenses, assessment leases, and mining leases, respectively. Sections 26, 44, and 70 of the act allow the minister to impose conditions requiring the holder of a license or lease to give security for the fulfillment of the obligations under the act.

A.3.126 The level of the security must be subject to regular review, if the amount is to reflect actual rehabilitation costs. Reassessment is tied to the periodic reporting against the environmental management plan (EMP). The DMR is able to vary securities between reporting periods in the case of changes in circumstances or plans. The titleholder is also able to request a review at any time. Where there has been a record of poor environmental performance by the operator, the eventual rehabilitation cost may be higher than the lodged security. In these circumstances the security should be reviewed

and increased as necessary. Conversely, where a risk has been reduced, the level of security may be decreased.

A.3.127 The mining operations plan (MOP) and the annual environmental management report (AEMR) are now required as a lease condition in all new mining leases for coal and minerals under the Mining Act 1992. The MOP documents the detailed design, geotechnical engineering, and operational method necessary to achieve the agreed outcomes of resource recovery, progressive mine site rehabilitation, and protection of the natural environment as generally prescribed under the Mining Act 1992. The key areas to be identified in the MOP include:

- area(s) proposed to be disturbed under the plan
- mining and rehabilitation method(s) to be used and their sequence
- existing and proposed surface infrastructure
- progressive rehabilitation schedules
- areas of particular environmental sensitivity
- land and water management systems
- proposed resource recovery.

A.3.128 The AEMR consolidates government reporting requirements that relate to environmental management and rehabilitation. It (a) addresses the controls used for protection of the environment with respect to water, air, noise, and blast; (b) reviews trends in environmental and meteorological monitoring data; (c) addresses waste management procedures; and (d) addresses any other environmental reporting requirements of the operation.

A.3.129 Under the new Protection of the Environment Operations Act 1997, licenses are required for scheduled activities and this includes mining. This legislation is administered by the NSW Environment Protection Authority and replaces a number of previous acts. This act includes:

- consolidating the regime for the issue of pollution control notices
- incorporating the offenses and penalties and adding a new offense of failure to notify the Environment Protection Authority of pollution incidents
- addressing voluntary and mandatory environmental audits and the circumstances in which such audit may be used in legal proceedings
- introducing criminal liability issues for environmental offenses.

A.3.130 Load based licensing (LBL) is being introduced for dust emissions, point source water discharges, and diffused water runoff contamination associated with mining.

The NSW Minerals Council considers that the draft guidelines are complex and onerous with potentially very large license fees. Their main disagreement is with the arrangements for dust where the scheme bears no relationship to the environmental impact and does not reflect practical management processes.

A.3.131 Other environment laws and regulations in NSW include:

- Environmental Planning & Assessment Act 1979 and Regulation 1994
- Contaminated Land Management Act 1997
- National Parks and Wildlife Act and Regulations 1974 as amended
- Soil Conservation Act 1938 as amended
- Threatened Species Conservation Act 1995 as amended
- Environment Protection Legislation Amendment Act 2002
- National Environment Protection Council (New South Wales) Act 1995
- Protection of the Environment Operations (General) Regulation 1998
- Protection of the Environment Administration Regulation 2002
- Land and Environment Court Regulation 2000.

A.3.132 Environmental management in NSW involves the application of comprehensive environmental and rehabilitation practices. The DMR is committed to ensuring that mining is carried out in a safe and environmentally responsible manner using the procedures listed in table A3.1.

Table A3.1. Environmental Management of Mining Operations in New South Wales	
<i>Commitment</i>	<i>Departmental officers are committed to environmentally responsible practice.</i>
Expertise	A high level of departmental expertise in environmental management and technical procedures is maintained through core staff expertise, training and education, and review of human and other resources and skills as necessary.
Advocacy	The department advocates best practice in environmental management through policies, codes of practice, and guidelines.
Promotion	The department promotes excellence in environmental management through continued sponsorship of the State Minerals Advisory Council's Award for Environmental Excellence in the NSW Minerals Industry.
Conditions of	Departmental environmental management and rehabilitation requirements are

title	communicated in the first instance through conditions on all titles and statutory approvals.
Management plans	Environmental management plans (EMPs) are being established for all coal mines. These plans facilitate efficient and systematic interaction between the department and mine operators concerning environmental management.
Departmental environmental audit	The department compiles environmental profiles for all operating mines as an internal feedback mechanism to allow proper allocation of resources to its environmental management responsibilities.
Field inspections	Adherence to conditions of title and performance assessment within EMPs is supported through routine field inspections by district inspectors.
Audits of operations	A targeted audit of a mine or other operation is an appropriate departmental response to poor environmental performance or a failure to respond adequately to departmental or ministerial directives.
Senior peer review	The department may seek the inspection of regional mining operations by a group of senior industry and departmental representatives in order to focus environmental awareness at the management level.
Planning focus meetings	Meetings between a mine proponent and representatives of all affected state and local government authorities are arranged by the department to facilitate communication in the mine planning stage.
Dispute resolution procedures	The department is able to facilitate communication between the local community and titleholders where they are in dispute over an operation's environmental management.
Review of security deposit	Most titles contain conditions that allow the minister to increase the amount or form of the security deposit held by him in order to ensure fulfillment of obligations, including environmental obligations, under the title.
Directions to comply	The Mining Act (Section 240) provides that the minister may cause a notice to be served on the holder of an authority or mineral claim to comply with environmental management and rehabilitation conditions included in the title. A financial penalty of up to A\$2,000 may be applied for failure to comply with a direction under this section.
Suspension of operations	Mining lease conditions authorize inspectors of mines to serve a notice in writing to the leaseholder to suspend operations that are in contravention of those conditions or any provision of the Mining Act and to carry out works within a specified time necessary to remedy the contravention.
Forfeiture of security deposit	The Mining Act provides that where the holder of an authority fails to comply with obligations under the act the minister may forfeit part or all of the security deposit held. Where security deposits on authorities are forfeited, they are applied by the department to the fulfillment of obligations not adequately undertaken.
Prosecution under the Mining Act	As well as prosecution under Section 240, prosecutions may be undertaken by the department under other sections of the Mining Act. The strongest of these provisions exist in Section 5, which provides for

1992	prosecution of persons mining or prospecting for Crown minerals otherwise than in accordance with the required title. Penalties of up to A\$10,000 and six months imprisonment may apply.
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A.3.133 Mine rehabilitation, a statutory requirement under the Mining Act 1992, aims at returning the land to its premining land use capability or to a land use that is consistent with the surrounding land fabric. To ensure the effective realization of these goals, mine closure and final rehabilitation are required to be considered as part of the MOPs and the AEMRs. The focus is thereby directed at encouraging final rehabilitation to be considered as an integral part of the overall mining process.

A.3.134 The reduction in greenhouse gas emissions, together with nominal carbon dioxide sequestration in mine site revegetation, is being actively pursued by coal mines. For the deeper, more gassy mines, gas drainage is now an integral part of the mining operation. This involves the extraction of methane and carbon dioxide from the coal seams prior to mining. Maintaining safety has been the primary motivation in developing this technology. However, in recent times the effective utilization of this valuable energy resource for the generation of electricity has been undertaken. Unique mine gas-use schemes have been designed in Australia to maximize gas use and hence maximize greenhouse gas emission reductions.

United Kingdom

A.3.135 The Environment Agency is the environment protection regulatory and enforcement agency in the United Kingdom. With respect to mining, its functions impinge on mining development, operations, and reclamation after mining ceases, including responsibilities relating to air quality, conservation, land quality, waste management, water quality, and water resources.

A.3.136 The Environment Agency is divided into a number of offices and services around the country. A central organization is the focus for setting national policy and for providing support to the regional area offices. Eight national centers provide technical and scientific expertise to support key areas. 22 national services, such as the National Laboratory Service and the National Library and Information Service, provide services across the agency. The Environment Agency is divided into eight regions each of which has a regional office. They provide coordination and technical and administrative support to 26 area offices, which are responsible for the day-to-day management of the area and for making sure that the needs of the local community are met. Each area office has a customer services department.

A.3.137 In the case of mineral workings, all applications to local authorities for sites of over 25 hectares (150 hectares for peat workings) must be accompanied by an environmental statement. Where applications are for sites with smaller areas, the mineral planning authority must consider whether the proposed development seems likely to have significant environmental effects. If this is thought to be the case an EIA must be requested and the applicant must provide an environmental statement before the

application can be approved. Consideration of environmental impact is fundamental to the town and country planning system, and these matters are examined in detail for coal mining applications.

A.3.138 The European Commission Strategic Environmental Assessment Directive was published in July 2001, and member states have three years from that date to implement it in national law. The directive will require a formal environmental assessment of certain plans, such as mineral local plans, and programs that are likely to have significant effects on the environment. Authorities, which prepare and/or adopt a plan or program that is subject to the directive, will have to prepare a report on its probable significant environmental effects, consult environmental authorities and the public, and take the results into account. Basic procedural and technical requirements are set out in the directive, which member states can implement within their existing systems.

A.3.139 The Coal Authority and the Environment Agency work together to prevent polluting outbreaks of mine water from abandoned coal mines and to reduce the impact of existing discharges, through a prioritized program of remediation. They recognize the need for responsible management of the respective financial resources available to them, and the need to avoid duplication of effort. The liaison is formally acknowledged in a memorandum of understanding.

Japan

A.3.140 The Environment Agency, established in 1971, is responsible for formulating basic principles and policies for administering overall environmental protection, pollution control, and nature conservation in Japan. Its primary duties include establishment of environmental quality standards and enforcement of the Air Pollution Control Law, the Water Pollution Control Law, the Noise Regulation Law, and other environmental laws.

A.3.141 The Ministry of International Trade and Industry has responsibilities for coal mine safety and coal-related environment protection.

A.3.142 Environmental policy requires a basic environment plan to be prepared that specifies measures that the national government must take, including surveys and research related to economic measures, as well as provisions for international cooperation on global environmental protection.

A.3.143 The major laws on environment relevant to the coal mining sector include:

- The Basic Environment Law 1993
- Environment Impact Assessment Law 1997
- Nature Conservation Law 1972
- Extraordinary Law on Coal Mining Damage Recovery Measure 1952, No. 295

- Law on Extraordinary Measures for Compensation, etc., for Coal Mine Damage 1963, No. 97
- Air Pollution Control Law 1968
- Noise Regulation Law 1968
- Vibration Regulation Law 1976
- Water Pollution Law 1970
- Mining Law 1950

A.3.144 Other policy and laws require local authorities to manage shallow mining subsidence problems and compensation issues. This scheme has some similarities to that operated by the U.K. Coal Authority, which has inherited the residual liabilities of the former BCC.

Coal Mine Closures and Policies

Coal Mine Closures and Policy Measures in Japan

A.3.145 Japan has taken various measures to identify mines for closure on a rational basis and to ensure adequate provision was made to deal with economic and social issues. These include:

- purchasing coal mines
- supporting coal mines that have had difficulties in meeting safety requirements to close their mines
- subsidies to support coal mine closures
- paying unpaid coal miners' wages, paying off debt and back taxes owed, and other measures to reduce financial burdens on unemployed workers and on the mines facing closure.

A.3.146 As a result of its coal mine closure policies, 915 coal mines have been closed in Japan since 1956. A five-step process was imposed to reform the coal mining industry using subsidies to lessen the social impacts that resulted. As a result, more than 202,000 mine workers have left the mines.

Background

A.3.147 From 1953 to 1955, the coal mining industry suffered serious domestic recession. The coal market boom driven by the Korean War had pushed coal output to 52.5 million tons. However, due to the subsequent economic backlash and the increase of imported energy as a countermeasure to high coal prices, the domestic coal demand fell to 43.7 million tons.

A.3.148 Domestic coal stockpiles rapidly increased and exceeded 4 million tons in June 1954, making stock control difficult, and the years 1953 and 1954 saw

approximately 200 cases of closure and abandonment of coal mines. Moreover, during this period, major mine operators implemented large-scale redundancy programs, displacing as many as 70,000 miners.

A.3.149 Small and medium-sized coal mine operators expected the government to buy their coal mines, as had been the case with inefficient mines closed at the end of World War II.

A.3.150 Meanwhile, it became necessary to introduce, as a relief measure for displaced miners, a system of buying where a certain calculation method was applied to the assets of closed coal mines to determine the amount of the buyout, which would be favorably allocated to the industrial adjustment of inefficient coal mines. Another reason for the buyout was that those who went out of the mining business and had their licenses revoked were still allowed to claim their mining rights over the related mining areas based on the principle of “first-to-file.”

A.3.151 A special corporation was established with responsibility for the acquisition of inefficient coal mines and related works. To prevent the restarting of inefficient coal mines, this corporation was exempted from the application of the Mining Law, so that it could not be engaged in the mining business even after the acquisition of the mining rights.

A.3.152 To secure the finances for the closure of inefficient coal mines, coal mine operators unable to rationalize were expected to voluntarily sell their mines to help the rationalization of the rest of the industry and the stabilization of coal demands. Coal mine operators that managed to rationalize and remain in the industry would become beneficiaries of the said measure.

A.3.153 Many mining companies became unable to pay external debts in general (loans from financial institutions and unpaid material and contract debts), as well as wages and retirement allowances for their employees or compensation for mine pollution victims. Municipalities in coal mining areas responsible for the welfare of displaced miners had extremely tight budgets, because of the increase in the expenditures on measures to deal with unemployment and the sharp decline of the tax revenues caused by the closure of mines and unemployment. Furthermore, because coal mining municipalities depended economically on mining companies and miners and their families, the mass closure of coal mines had a devastating impact on related local industries, causing depopulation of the municipalities and the collapse of the local economy.

A.3.154 The first planned step involved closing 273 coal mines from 1956 through 1963, which reduced coal production by 6.3 million tpa and made 40,000 coal mine workers redundant. By that time, a total annual production of nearly 74 million tons had been discontinued and over 206,000 people were laid off.

A.3.155 Ten laws were drafted, enacted, and enforced to promote mine closures. In total, eight policies related to mine closures were enacted. The first seven policies were

aimed at protection of those adversely affected by mine closures and were politically oriented. The eighth and last policy called for a study to review the mine phase-out program and make recommendations for the future.

A.3.156 The acquisition standard, “PC,” was formulated to determine the economic efficiency of the coal mines whereby “P (ton/month/person)” stood for production efficiency and “C (kcal/kg)” for calories. The multiplied value of these two factors discriminates the inefficient ones from the efficient ones. An index for an inefficient coal mine was 60 percent or less of the “PC” value.

Mine Closure Policies

A.3.157 Various policies were applied over many years to rationalize the coal sector. In the 1950s, the government purchased and closed poorly performing small and medium-size coal mines. Interest-free loans were made available and a guideline established for the sales prices of coal.

A.3.158 In the 1960s, mines with recurrent safety problems were closed. By the early 1970s, almost all of the small and medium-sized coal mines and other mines with safety problems had been closed. By that time 880 mines had been closed and only 35 mines were continuing. From then onwards, subsidy payments were calculated on the basis of retirement allowances to be paid to mine workers at the time of closure rather than on the remaining reserves as had been the case before.

A.3.159 The beneficiaries of compensation at the various stages were those who lost mining rights and leases and dismissed miners on the basis of the recommendation to abandon mining operations.

A.3.160 **Regeneration Measures for Former Coal Mining Areas.** The New Energy and Industrial Technology Development Organization (NEDO) was established in Japan to manage the regeneration of the mining areas and promote the development of new business activities.

A.3.161 **Reemployment Measures.** Reemployment measures taken included:

- Assistance to mine workers for their change of job.
- Establishment of vocational training schools.
- Extension of insured period to pay against jobless claims under unemployment insurance to a maximum of five years.
- Preferential treatment of any company that employed retired mining workers.
- Employment of former mine workers on any rehabilitation project or development project in the deprived mining areas.
- Issue of job application record books. According to the Law for Temporary Measures for Stable Employment of Coal Mine

Workers (enforced in 1959) and the Law for Temporary Measures for Stable Employment of Workers in the Specified Declining Industries (enforced in 1983), what were called “Black Record Book” and “Green Record Book” were issued for coal mine job leavers. The Black Record Book was for coal mine workers who had been employed for one year or more before they left by the mining company or by a subcontractor on a job inside of a coal mine or a job for essential services outside the mine. The Green Record Book was for all other mine personnel not eligible for the Black Record Book.

- Allowance for coal mine job leavers (a) as a benefit of the unemployment insurance, its base allowance was paid (max. for 300 days) from the next day they lost the job and it was extended for a certain period (mostly for 90 days) if they were not employed yet, and (b) for those who were still unemployed at that point, the employment promotion allowance was paid until the Record Book was expired (in three years and one year after losing the job for the Black Record Book holders and for the Green Record Book holders, respectively). As for the level of these allowances, the unemployment insurance base allowance was about 50 percent to 80 percent of the daily wage before losing the job.
- Vocational training was carried out free of charge in principle for those who wished to participate, and a Training Allowance and Participation Allowance were paid during the training period.
- For those who were going to be reemployed, the Employment Preparation Allowance was paid, the amount of which depended on the number of days since leaving the job. The Employment Preparation Allowance had the following programs for the Record Book holders: (a) the Employment Preparation Allowance equivalent to 180 days, 100 days, and 80 days of the daily employment promotion allowance for those whose reemployment after leaving the job was in less than one year, one year to one year and a half, and one year and a half to two years, respectively; (b) either of the following applicable to those in the eligible period of the unemployment insurance benefit: the Reemployment Allowance was paid depending on the number of days left until the expiration of the benefit with the minimum payment of 30 days of the daily base allowance or the Constant Employment Preparation Allowance with fixed 30 days of the daily base allowance was paid regardless of the number of days left until the expiration of the benefit for those not eligible for the Reemployment Allowance who were 45 years or older and were reemployed by the

introduction of the employment security office. These were the incentives to promote early reemployment. In addition, for those who had to move their residence for job application or reemployment, the Transfer Allowance was paid.

Coal Mine Closures and Policy Measures in the United Kingdom

A.3.162 In the post–World War II period, employment in British coal mines dropped from about 700,000 to 12,000 at present as a consequence of various events and actions by the government. The following describes measures to mitigate the social and environmental impact of mine closures.

Reducing Socioeconomic Impacts of Coal Mine Closure

A.3.163 All of the areas in the United Kingdom affected by coal industry closures have made significant efforts to attract new industries. The creation of Enterprise Zones by the U.K. government in many coalfield areas, offering fiscal incentives to new businesses to set up there, has been of considerable benefit in helping to offset further economic decline.

A.3.164 Following a change of government in 1997, a task force was created to assess the social and economic conditions in the U.K. coalfields. This, in part, was politically driven since, in order for the U.K. government to get approval to divest itself of the coal mines it had nationalized years before, it needed the support of the coal industry. As a result of the task force report, new initiatives were undertaken to create a framework for a long-term program aimed at the economic regeneration of these areas. The measures outlined in the government’s 10-year plan included:

- Allocating over US\$150 million annually to coalfield area regeneration.
- Creating regional development agencies to lead economic development and coordinate existing regional spending programs.
- Investing an additional US\$500 million over the first three years.
- A Coalfields Regeneration Trust to support community initiatives (US\$65 million).
- A Coalfields Enterprise Fund to support small business with high growth potential (US\$22 million).
- Other initiatives aimed at regenerating former mine sites to create new industrial parks, transportation infrastructure, and housing to create new jobs. In addition, the program included initiatives for renovation of existing public-sector housing and improved education in the former coalfields.

Employment Options

A.3.165 From the 1950s until the early 1980s, job losses associated with most mine closures were handled through a combination of voluntary redundancy, early retirement, and internal transfers within the National Coal Board (NCB). Typically some 60 percent to 70 percent of workers took redundancy, with the remainder preferring to transfer.

A.3.166 The age of voluntary early retirement scheme stipulated by the BCC was reduced to age 50. The BCC also introduced a series of increasingly attractive lump-sum payment schemes, aimed at inducing progressively younger miners to leave the industry voluntarily. The total cost of all early retirement and redundancy payments between 1985 and 1995 reached almost US\$10.9 billion, of which about US\$264 million came from the European Coal and Steel Community (a European institution formed before the European Union was established).

A.3.167 Between 1952 and 1994, all NCB/BCC miners were covered by a special contributory pension scheme. Since 1994, the government has guaranteed the scheme, while a new pension scheme was established for miners in the privatized industry after 1995. All ex-miners are entitled to an industrial pension from the age of 60, while those who left the industry after 1992 can opt to receive a reduced level of pension from age 50.

British Coal Enterprise

A.3.168 British Coal Enterprise (BCE) was established in 1985 with the aim of helping—through working with other agencies—to create jobs and stimulate economic regeneration in the coalfield areas.

A.3.169 The BCE was established as a wholly owned subsidiary of BCC with an initial capital, funded by the government, of US\$8.25 million, a figure that had been increased to US\$100 million by the early 1990s. Following privatization of BCC at the end of 1994, parts of BCE were also sold to the private sector, although by 2001, only some property assets appear to have remained. BCE's funding activities encompassed the provision of soft loans to small business. Loans were capped at the lesser of US\$8,250 per job created or 25 percent of total funding requirements. Interest rates charged were typically about 2 percent above base rates and the maturity date of loans was 5–7 years. Specific criteria that businesses had to satisfy in order to obtain financing from BCE included:

- new jobs had to be created during the life of the loan
- new jobs must not displace other jobs in other businesses
- the business must be located in a coalfield area
- business viability had to be demonstrated.

A.3.170 BCE's funding role proved valuable to start-up businesses, since once BCE had offered assistance, it was often easier to attract further financial support from other commercial sources. By early 1994, BCE had cumulatively invested US\$140 million in over 4,300 business development projects.

A.3.171 The provision of workspace to new business progressed from using covered BCC properties to the development of custom-designed units located on industrial estates. Some offered administrative services, and all were provided under short-notice conditions whereby new businesses could move in or out or into larger premises as circumstances required.

A.3.172 BCE's outplacement and training activities centered on its management of BCC's Job and Career Change Scheme (JACCS) for its former employees. Between 1987 and 1993, BCE established over 200 Job Shops at closing mines. The services provided at these Job Shops covered career counseling, job search methods, the preparation of resumes, interview techniques, and advice on retraining.

Postclosure Environmental Liabilities

A.3.173 The closure of mines and cessation of water pumping and ventilation can lead to pollution and uncontrolled emissions of flammable and asphyxiating gases to the surface. Measures can be put in place to prevent these problems from developing. However, there is a continuing cost of monitoring, inspection, and remedial work for which both management and financial provision is required. Surface instability problems, often associated with old, shallow abandoned workings and mine entries can also occur, which will require treatment to protect the safety of the public and built development.

A.3.174 Current U.K. procedures require the operator of a closing mine, through consultation with the Coal Authority, the Environment Agency, and local authorities to mitigate future environmental risks resulting from mine-water recovery and pressurization of mine gases in the abandoned workings. The stability of abandoned entries is ensured by adopting approved engineering principles and measures are taken to assess surface gas. Water emission hazards require monitoring regimes and preventative measures, such as gas pressure relief vents through the seals on mine openings. Some of this experience was gained in hindsight after serious incidents, and lessons could be learned by China that may prevent future problems arising from closure of large mines.

A.3.175 The Coal Authority is responsible for managing postclosure liabilities, and the government for meeting any costs that cannot be recovered.

Fiscal Regimes

Tax Regime in the United States

A.3.176 In the United States, both the federal and state governments impose taxes. The federal corporate tax rate at 35 percent is effectively around 25 percent after taking into account the depletion allowance for coal. State taxes vary but typically are in the 4–5 percent range. There are many minor taxes and fees that vary from state to state.

A.3.177 Federal taxes include:

- income tax
- production taxes (black lung and abandoned mine lands fee)
- employment taxes (Social Security and Medicare)
- production royalties only on federal lands
- bonus bids and lease fees only on federal lands.

A.3.178 State taxes include:

- income tax
- mining tax (under 1 percent in some western states)
- severance tax in some states (either a per ton charge or percentage of sales value)
- sales tax (most states)
- ad valorem property tax (a few states have this).

A.3.179 There are also reclamation bonds and fees.

Tax Regime in Australia

A.3.180 In Australia, three governmental bodies, federal, state/territory, and local, impose taxes. In addition to royalties (described in annex 2), the following taxes are of particular interest for mining companies.

A.3.181 **Exploration.** Exploration costs for minerals can be included in the financial loss within the tax year when that expenditure occurred, provided the claimant is legitimately engaged in the mining business.

A.3.182 **Depreciation.** The tax deduction through depreciation is approved for depreciable assets such as machines, equipment, and fixtures. The land, inventory, and many intangible fixed assets are excluded from depreciable assets, but concession and information regarding mining, quarrying, and trial boring are included in depreciable assets, though intangible ones.

A.3.183 **Restoration Costs.** Expenditures of restoration to original state of mining, drilling, and quarry sites are categorized to capital expenditures and may not be included in the financial losses of ordinary expenditures. Standing reasons are that those expenditures are not deemed occurred from the earning acquisition of taxable income, and also that their occurrence is usually after the cease of mining business activities. However, the expenditures of restoration to original state of mining/oil drilling/quarry sites are approved for special tax deduction totally in the year when the expenditure was practiced, regardless of ordinary expenditures or capital expenditure. The conditions to be eligible for special tax deduction are that the beneficiary of the special deduction is already engaged in mining, mine searching, or trial boring, or any accessory activities of

mining business. The restoration work to original state has to be carried out to the same state as before mining operation or to a rationally similar state before mining operation.

A.3.184 **Survey Fees of Environmental Impacts.** Survey fees of environmental impacts can be included into financial losses throughout the remaining year of the corresponding project and are calculated using the same declining balance method as for special tax deduction of capital expenditures. Equipment cost used for a survey depreciates according to the stipulation of ordinary depreciation in the tax law.

Policies to Promote Domestic and Foreign investment

United States

A.3.185 About 99 percent of coal production in the United States is consumed domestically: power generation accounts for about 90 percent of the total coal consumption, and coal-fired power plants account for more than 50 percent of total generation capacity. The second-largest market after electric power generation is the industrial sector, including chemicals, cement, stone clay and glass, paper, and food processing. The manufacture of iron and steel, traditionally coal's second-largest market, has slowed considerably in recent years. As a result, the consumption of coal for production of coke also has been reduced.

A.3.186 About 10 percent of U.S. coal is exported to other countries. The main customers are Canada, Japan, and some countries in Western Europe and South America, with some deliveries to South Korea and Taiwan, China. In 2000, 58.0 Mt of coal was exported.

A.3.187 Most coal produced in the United States is sold on long-term contracts with consumers (80 percent); only a small part is sold by a coal agent. Coal companies in the United States, as elsewhere where market economics apply, regard market demand as a prerequisite for determining coal production and quality requirements.

A.3.188 The United States has had no specific policies on coal market and sales policies, since it has always relied on the use of market forces. One issue that deserves special attention is the Commerce Clause of the U.S. Constitution, which allows the U.S. government to prohibit individual state actions that impede trade, including transport, of goods between states. In the case of coal, this means that coal can be transported from a coal-producing state to a coal-consuming state through other states unimpeded, as long as all federal laws are complied with. Thus, no one state can stop coal flow by prohibiting its movement into or out of its borders or levying taxes or fees on the coal that flows through its borders, just because the state opposes coal use. A similar idea could be considered for China to improve the free flow of coal between provinces.

Foreign Investment in U.S. Coal Mines

A.3.189 Foreign companies have actively invested in the U.S. coal industry in recent years through acquisitions of equity in existing coal mining companies. According to DOE figures, the share of foreign affiliates involved in U.S. coal production has grown

from almost 0 in the 1970s to 26.4 percent in 2000, and the production of foreign direct investment companies reached 283.5 million short tons. Since the United States has no general foreign investment law, there is no overall definition of foreign investment. There are definitions of foreign investment in specific contexts, such as U.S. bilateral investment treaties and the North American Free Trade Agreement (NAFTA).

A.3.190 The United States has no general foreign investment law nor is there a specific government agency that must approve foreign investments. The International Investment and Trade In Services Survey Act requires that all foreign investment in U.S. enterprises in which a foreign person owns a 10 percent or more voting interest must be reported to the Bureau of Economic Analysis of the Department of Commerce.

A.3.191 Investment in coal is not restricted. However, there are restrictions under the Energy Policy Act with respect to who can receive financial assistance. There are definitions of foreign investment in specific contexts, such as U.S. bilateral investment treaties and the NAFTA.

A.3.192 There are no problems in an American coal mining company using foreign investment from any legitimate international source.

A.3.193 In making a major investment in a U.S. coal company, most foreign companies seek the assistance of a U.S. legal firm and an investment adviser.

A.3.194 Once a company obtains rights to coal from either a private party or through federal leasing, the rights are readily transferable to any legitimate company. However, U.S. Bureau of Land Management needs to approve of transfers of leases to other companies. The regulations with respect to federal leases probably require the establishment of a U.S.-based affiliated company under the laws and regulations of the United States.

Australia

A.3.195 Australia is the world's largest exporter of bituminous coal, a position it has held since 1984. In the intervening years, annual exports have grown from 76 million tons a year to more than 265 million tons in 2001. It exported 73 percent of this production (194.4 Mt), making Australia the world's largest coal exporter (a position it has held since 1986), accounting for about 30 percent of world trade. As in China, coal (including lignite) is Australia's major source of power, providing over 80 percent of total fuel input for electricity generation, about 45 percent of total energy needs in 2000.

A.3.196 Australia expects to remain a dominant supplier of steam coal and increase its share of the international coking coal market. Additional capacity will be required from existing and new mines to meet this new demand. The industry is currently considering investment projects worth over A\$5.5 billion, of which over A\$2.4 billion has been committed.

A.3.197 The Australian government does not become involved in commercial negotiations. A wide variety of metallurgical and thermal coals are available, and

producers have the flexibility to tailor products to suit customer requirements. All coal is marketed by private sector producers or their agents.

A.3.198 Given the industry's export orientation, producers understand customer requirements for reliable, competitively priced supplies. They are continually working to reduce costs to ensure that the Australian coal is competitive with other energy supplies around the world. The industry is currently undergoing rationalization, which has resulted in fewer producers. The result of this is greater financial strength of the industry, vigorously competing in the global marketplace.

Foreign Investment Policy and Rules

A.3.199 The Australian government's approach to foreign investment policy is to encourage foreign investment consistent with community interests. Foreign investment provides scope for higher rates of economic activity and employment than could be achieved from domestic levels of savings. Foreign direct investment also provides access to new technology, management skills, and overseas markets.

A.3.200 Australia has benefited considerably from foreign investment in the coal industry. Access to foreign capital has facilitated substantial industry development. The big four, BHP Billiton, Xstrata, Anglo Coal, and Rio Tinto, have been consolidating their positions in the Australian coal industry through strategic mergers and acquisitions. Foreign-owner share of Australia's total salable production is over 50 percent.

A.3.201 Foreign investment in Australia is regulated primarily through a regime established under the Foreign Acquisitions and Takeovers Act 1975 and supplemented by government policy. That regime is administered by the Australian Treasurer and the Foreign Investment Review Board (FIRB), an advisory body within the Commonwealth Department of Treasury.

Screening by the Foreign Investment Review Board

A.3.202 The regulatory authority over foreign investment in Australia belongs to the federal government and the Foreign Acquisitions and Takeovers Act is the basic act of this authority. The act authorizes discretionary power in specific cases to the minister of financial affairs, but practically, the FIRB, a nonstatutory body established in April 1976, plays a central role in foreign investment regulations and its administration. The FIRB examines proposals by foreign interests to undertake direct investment in Australia and makes recommendations to the government on whether those proposals are suitable for approval under the government's policy. The FIRB's functions are advisory only. Responsibility for the government's foreign investment policy and for making decisions on proposals rests with the treasurer. The main functions of the board are to:

- examine proposals by foreign interests for investment in Australia and, against the background of the government's foreign investment policy, to make recommendations to the government on those proposals

- advise the government on foreign investment matters generally
- foster an awareness and understanding, both in Australia and abroad, of the government's foreign investment policy
- provide guidance, where necessary, to foreign investors so that their proposals may be in conformity with the policy
- monitor and ensure compliance with foreign investment policy.

A.3.203 The types of proposals by foreign interests investing in Australia that require prior approval are:

- acquisitions of substantial interests in existing Australian businesses with total assets over A\$50 million or where the proposal values the business at over A\$50 million
- proposals to establish new businesses involving a total investment of A\$10 million or more
- takeovers of offshore companies whose Australian subsidiaries or assets are valued at A\$50 million or more or account for more than 50 percent of the target company's global assets
- direct investments by foreign governments or their agencies irrespective of size
- proposals where any doubt exists as to whether they are notifiable, for example, funding arrangements that include debt instruments having quasi-equity characteristics will be treated as direct foreign investment.

A.3.204 Investments between A\$10 million and A\$50 million are normally approved without detailed examination, while proposals over A\$50 million are normally approved unless considered to be contrary to the national interest.

Additional Incentives

A.3.205 In the 1990s incentives were broadened to encourage establishment of regional headquarters (RHQ) of foreign enterprises in Australia. This incentive includes:

- exemption of wholesale tax against the import of secondhand computers and related equipment at the time of establishment of RHQ
- application of grant (for feasibility study of RHQ) to foreign companies
- exemption of withholding tax of specified dividends within Australia
- tax exemption for expense of office removal

- simplification of visa procedures.

A.3.206 Also, the government introduced legislation to introduce competition to all industries aimed at fair trade, commodity price repression, economic growth, and job creation. Relative to enactment of the act, the Committee and the Bureau of Price Supervision was amalgamated to set up the new Committee of Australian Free Competition and Consumers, which continues to supervise fair trade and prices.

A.3.207 A later government eased foreign capital control in September 1999. The minimum investment amount, requiring advance application or advance report to the government for foreign enterprises that purchase substantial rights and interests of an Australian enterprise, establish a new venture, and purchase assets of foreign enterprises in Australia was raised to A\$50 million.

A.3.208 Furthermore, the plan to minimize the time to obtain approval was also taken up regarding the lesser investment of no more than A\$50 million, on top of past substantial simplification of examination procedures, in order to back up the decision to raise this limit from no more than A\$50 million to A\$100 million.

A.3.209 The federal government published decisions in September 1999, as a part of its taxation reform, to reduce corporate tax from 36 percent gradually to 30 percent effective July 1, 2001, and to reduce the maximum of capital gain tax from 48.5 percent to 24.25 percent effective as of October 1999. In addition to the fact that Australia has a favorable environment for investment that includes a stable political situation and legal system, these government decisions were successful in attracting more investment to Australia.

A.3.210 The NSW government also is strongly encouraging investment in exploration and mineral development in NSW with the recent allocation of another A\$30 million for a new seven-year program to update the state's geological database. This funding is in addition to the previous A\$30 million that was provided to the very successful Discovery 2000 program, which resulted in A\$150 million of additional mineral exploration investment by industry in NSW. The new initiative will fund major geophysical surveys, geological mapping, exploration-related research, plus data compilation and delivery.

Coal Sales and Transportation

Coal Transport in Australia

A.3.211 There are numerous mines, rail, road, and port facilities in Australia, offering customers the alternative supply sources from within the country. The mines are efficient, modern, and many have on-site preparation plants. All have access to efficient transport facilities to transport export coal to the ports.

A.3.212 **Infrastructure.** Coal transportation in Australia is handled by a network of rail, road, conveyor, and shipping systems. Most export coal, however, is transported to port via rail networks owned by the state governments of Queensland and NSW.

Access to the NSW coal rail system for private operators began in July 1996. Competition policy reform is also having significant impacts on improving business competitiveness through third-party access for coal freight and resulted in significant reductions in rail freight rates. Continued expansion has occurred in the transport and export terminal infrastructure within the NSW coal industry. Planned major investments by the NSW government and private industry to expand and upgrade transport and loading facilities will enable the industry to support the forecast increase in coal production.

A.3.213 **Ports.** The coal export industry is serviced by nine coal terminals at seven ports along the eastern coast of Australia. The terminals have a combined annual loading capacity of 237 Mt. All coal ports in Australia have the capacity to further increase their coal-handling capacity in line with market projections.

A.3.214 **Rail.** Coal transport onshore in Australia is based on the use of trains with carrying capacities of up to 9,000 tons in NSW and up to 9,600 tons in Queensland. The export industry is serviced by nearly 50 rail-loading terminals at or near mine sites. Rail transport also contributes to moving coal to domestic consumers. In Queensland, export coal is transported over a rail network owned by Queensland Rail (QR), which is a government-owned corporatized entity. QR has a single vertically integrated railway. However, it has a separate Network Access Group, managing the track and access arrangements, so that internal QR operators and external rail operators are handled on the same basis. All of QR's operations are subject to competition. In 2000, the rail network in Queensland hauled 109 Mt of export coal, an increase of 7 percent from 1999. QR's coal network links over 30 coal mines with 6 export coal terminals on the eastern seaboard. The rail system represents approximately 2,000 kilometers of rail line of which about 70 percent is electrified. QR endeavors to ensure rail haulage capacity, closely working with ports, domestic facilities operators, and mines. Further expansion and improvement works proposed by QR up to the year 2004 will lift coal haulage capacity to approximately 120 million tons a year and involves expenditure of more than A\$800 million (US\$486 million) to replace aging wagons and diesel locomotives, purchase 38 new 4000-class diesel locomotives and over 2,000 new coal wagons, and to upgrade track and associated infrastructure. QR is also developing and implementing its e-commerce strategy to streamline communication and reduce duplication of tasks.

A.3.215 In NSW, coal rail freight services are provided by FreightCorp, a state-owned commercial freight rail operator. On July 1, 1996, FreightCorp was corporatized, allowing it to compete by developing a strong commercial focus. The NSW coal rail network extends over 1,050 kilometers and links 25 coal loading points. The rail system handled approximately 85 percent of total export coal within NSW in 2000/01, while FreightCorp hauled 70 million tons of export coal to the ports and delivered over 2 million tons to local markets.

Coal Transport in the United States

A.3.216 As in Australia, there are numerous mines, rail, road, and port facilities in the United States. The mines are efficient, modern, and many have on-site preparation plants. All have access to efficient transport facilities to transport export coal to end users.

A.3.217 Two-thirds of all coal transport is by rail. Barge and truck shipments collectively account for a little less than one-quarter, with the balance attributable to other methods of transport, including tramways and conveyors, as well as water-borne shipments on the Great Lakes and by tidewater. Rail transport is used for long-distance shipments while trucks are used for local coal movements. In many cases, a combination of transport modes is used for very long shipments. The share of each transport mode has varied over the years as the sources of coal supplies have changed.

A.3.218 Transportation costs can add up to 50 percent to the price of coal at the mine-mouth. The ratios for the medium- and high-sulphur coals rose because the average mine-mouth prices of these coals declined. The rail rates per ton declined also, but not as rapidly as coal prices in the unsparingly competitive coal industry. In general, the higher the sulphur content of the coal, the smaller the portion of delivered price made up by transportation costs. Thus, among all coal shipments, the lowest average distances over the years are for high-sulphur coal and the average rates per ton are therefore relatively low. This accounts both for high-sulphur coal having the lowest transportation cost as a percentage of delivered price and for it having the highest rate per ton-mile

Comparative Table Problems and Recommendations

	<i>Problems in China</i>		<i>United Kingdom</i>	<i>United States</i>	<i>Japan</i>	<i>Australia</i>
Government's coal administration	Government's coal administration system	-The goal to reduce the interference of the central government in mining enterprises is sound. However, the process of transferring authority to the province level has led to confusion and uncertainty as to where approval authority lies, as well as to a burdensome approval process. Strengthening the administrative capabilities of provinces, clearer investment regulations, and greater transparency in the approval process is needed.	Good. The U.K. government has clear rules regarding coal administration and delineation of roles and responsibilities between national and regional governments.	Good, but complex. Many government agencies at federal and state levels are involved in coal-related decisionmaking. Administers coal on federal lands. Rules, roles, and responsibilities are clear and well enforced.	Good. However, substantial government guidance in decisionmaking. Large subsidies are used to implement government policies.	Good. Clear and simple rules. Roles and responsibilities between federal and state governments clear.
	Legal and regulatory system	-Lack of a set of clear laws and regulations governing the coal sector. -Regulations pertaining to mining need to be updated to conform to international standards. -Lack of consistent enforcement of regulations is a serious concern to investors.	Good. Legal system well defined and operating.	Good. Legal system well defined and operating. Tends to be highly legalistic, which adds costs to business enterprises	Legal system favors Japanese companies.	Good. Legal system well defined and operating.
	Government's enforcement of coal mine-related laws and regulations	-Resources insufficient for the enforcement of laws and regulations. -Lack of training for both managers and miners, especially in TVCMs. -Safety supervision is weak, and penalties for violations are generally too small.	Good. Rules and regulations consistently enforced.	Good. Rules and regulations consistently enforced.	Good. Rules and regulations consistently enforced.	Good. Rules and regulations consistently enforced.

	Rationalization of coal mining sector	<ul style="list-style-type: none"> - Enforcing small mine closures. - Mitigation of social impact after mine closure. - Inadequate provision for postclosure environmental liabilities. 	Detailed social mitigation measures. Government responsible for liabilities.	N/A. Grown as market-based, government- regulated private sector.	Detailed social mitigation measures. Government responsible for liabilities	N/A. Grown as market-based, government regulated private sector.
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	<i>Problems in China</i>		<i>United Kingdom</i>	<i>United States</i>	<i>Japan</i>	<i>Australia</i>
Coal mining enterprises	SOCMs' dilemma	<p>- Challenges remain in moving from planned, government-run enterprises to competitive, market-oriented enterprises.</p> <p>A few large enterprises, favored by the central government, are performing well. However, most enterprises have yet to adapt to operating strategies that can compete under market-oriented conditions.</p> <p>-Underdeveloped social infrastructure is hindering the progress.</p>	Nationalized coal industry now privatized.	N/A – market-based private industry.	Moderate. Historically, government influences private-sector decisions; sometimes impedes competition, especially from foreign companies	N/A – market-based industry. In the past, strong unions sometimes slowed innovation in mining.
	TVCMs' competition	<p>-Free access to coal resources by TVCMs.</p> <p>-Disorderly coal development and fluctuation of market price.</p> <p>-Historically, coal resources were made available without charge, and were often developed inefficiently, resulting in the loss of large coal reserves that will now never be mined.</p>	N/A	Active competition encouraged, leading to lower consumer coal prices. Federal coal leasing through bidding increases competition and ensures coal resources are sold at market prices.	N/A	Good. Government owns most resources, but has not impeded competition or exports in recent years.
	Funds for new investment	-A few government-favored coal companies have had access to adequate funds. However, the majority of Chinese mining enterprises have had difficulties in raising funds, in part due to their poor financial performance in the past, and also difficult business conditions.	Good. Market-based system results in financing for good projects.	Good. Market-based system results in financing for good projects.	Unknown.	Good. Market-based system results in financing for good projects.
	Social and welfare burdens on KSOCMs	KSOCMs carry substantial social infrastructure costs that reduce competitiveness with central government subsidies offsetting some of the burden.	Social infrastructure costs borne by the government and local community. Mining companies provide health and welfare support to employees and families as part of a remuneration package.			

	<i>Problems in China</i>		<i>United Kingdom</i>	<i>United States</i>	<i>Japan</i>	<i>Australia</i>
Coal investment for foreign investors	Approval system regarding coal investment	-Too many government agencies involved in the approval procedures and lack of transparency in approval process. -Too many redundant steps and requirements included in the approval procedures.	Good. Only a few agencies involved; rules clear.	Moderate. Many agencies and approvals required, particularly concerning health and safety and other environmental issues. But, the process works (with delays and added costs).	Good. Only a few agencies involved.	Good. Only a few agencies involved; rules clear.
	Legal stipulations concerning foreign investors' coal investment	-Absence of a sufficient legal basis to assure the foreign investors in the coal sector that their interests are protected and of equal access to quality coal resources, rail transport, and export authority. -Criteria adopted in the approval of coal investment project unknown to investors.	Good. Rules for foreign investment in U.K. industries clear.	Good. Rules for foreign participation in coal leasing clear.	Moderate. Foreign investment in Japanese industries difficult; investment processes not transparent.	Good. Laws enacted to ensure fair trade and foreign participation in coal and other industries actively encouraged in recent years.
	Information for foreign investors	-Difficulty in gaining correct and detailed information. -Difficulty in keeping up with the rapid changes in government policies and market conditions.	Good. Information on resources, prices, rules, and regulations well documented and available to all.	Good. Information on resources, prices, rules, and regulations well documented and available to all.	Poor. Information for foreign investors difficult to obtain; process not completely transparent.	Good. Information on resources, prices, rules, and regulations well documented and available to all.

	<i>Problems in China</i>		<i>United Kingdom</i>	<i>United States</i>	<i>Japan</i>	<i>Australia</i>
Coal investment by foreign investors	Coal distribution	-Regulations on coal export rights in hands of four companies, resulting in concerns about fair treatment, particularly when competing interests are major national coal companies. -Access to railway transportation service uncertain and lacks flexibility to respond to changing market conditions.	Good, but declining. Good port, rail, barge, and truck infrastructure.	Good. Transportation infrastructure outstanding. Coal considered an important part of the financial successes of the freight rail infrastructure.	Good port infrastructure, but internal infrastructure less developed.	Good. Well-developed transport and port system.
	Access to joint venture capital	-Restriction on capital contribution ratio dampening joint ventures' desire to increase capital. -Slow loan approval system makes it difficult for the Chinese partner to raise funds.	Good. Foreigners mostly treated on par with domestic investors.	Good. Foreigners mostly treated on par with domestic investors.	No foreign investors.	Good. In recent years, foreign companies treated essentially on par with domestic investors.
	Securing sound investment projects	-Available quality coal resources suiting foreign investors' criteria are limited. -Underdeveloped social infrastructure. -Difficulties in acquiring an established coal mine.	Limited economic coal reserves available.	Good. All opportunities made available to all willing participants.	No economic coal reserves available.	Good. All opportunities made available to all willing participants.
Multiple business strategies to increase the return on investment	Lack of incentive for the supply side	-Financial and technical difficulties. -Inefficiency of the vertical administrative system hampering the multiple business opportunity.	Domestic coal is too expensive as an input to multiple business ventures.	Good. U.S. coal producers now entering power production business and are major coalbed methane producers.	Domestic coal is too expensive.	No barriers. Some companies invest in both coal mines and power plants as well as coalbed methane recovery and use.
	Lack of incentive for the demand side	-The complex negotiations and approvals for a single project are multiplied when multiple businesses are considered.	Domestic coal is not competitive with alternative fuels or imported coal.	Good. Coal prices very competitive and multiple business activities occur (coal mining and power generation).	Domestic coal is too expensive.	Good. Coal prices very competitive, and multiple business activities occur (coal mining and power generation).

Annex 4

Case Studies

Qingxu County, Shanxi, Coal Mining Administration

Introduction

A.4.1 Qingxu County is under the jurisdiction of Taiyuan City, the provincial capital. The county covers an area of 609 square kilometers, consisting of 4 towns and 5 townships, with a total population of 300,000. The county has 175 square kilometers of coalfield with total proven coal reserves of 3 billion tons including anthracite and coking coals. There are 5 county-owned and 24 village-owned mines employing 3,000 miners producing a total of 1.5 Mtpa of coal, half the available mine capacity. The main product is blended coking coal but only 6 of the 81 coking enterprises that existed prior to 2000 now remain. Coal mining and coal processing is the main source of fiscal revenue to the county.

Work Safety Supervision

A.4.2 A Work Safety Supervision Bureau was established in 2002 with a total of 57 staff. Its functions are a combination of coal mine administration, drafting of regulations, and operational safety. There are five bureau-level officials, one director, one general secretary, a chief engineer, and three deputy directors.

A.4.3 The bureau has drafted many regulations including: “Acceptance standards for re-production of coal mines,” “Responsibility system of fixed coal mine supervision,” “Implementation details for supervision and examination of coal mines by region,” “Comprehensive examination standards for coal mine safety,” “Risk deposit system for coal mine safety,” “Risk deposit system for public servant’s safe production,” “Regulations for punishing the mine enterprise with major accident hidden risks and the ‘three violations,’” and “Working meeting system for coal mine safe production.”

A.4.4 Mine safety is monitored using a scoring system, and production must be stopped if the score falls below 60 percent and cannot be resumed until it attains 80 percent. Illegal activities attract modest fines of 10,000 Yuan for producing coal without permission, 5,000 Yuan for mining beyond boundaries, 2,000 Yuan for a major hidden risk, and 1,000 Yuan for unsafe practice. Administrative transgression is therefore considered more serious than work safety. Each mine is required to deposit 200,000 to 300,000 Yuan security with the bureau from which fines are drawn. However, this would not be effective for a mine that

produced coal without permission. There have been no major accidents (more than three fatalities in a single incident) over the past five years and no fatalities since the end of 2002. However, it is too early to judge the effectiveness of current safety measures. Funding of safety management is largely dependent on fee income from coal mine administration. The financial well-being of the mines and the Work Safety Supervision Bureau are therefore too closely linked.

A.4.5 At the beginning of 2003, gas monitoring systems were installed in all the mines in Qingxu County and it is planned to interconnect these later in the year.

Environmental Protection

A.4.6 The county Environmental Protection Department, established in 1996, has a staff of 35 with responsibilities for all industrial pollution control within the county. It has six divisions, including administrative office, planning and finance, pollution control, supervision, development, and laws and regulations. The department also has three independent public service units, namely an environmental monitoring station, environmental pollution control research center, and an environmental hygiene disinfection center.

A.4.7 Its duties with respect to coal mining include supervision of environmental protection measures at mine construction and control of pollution from waste rock and wastewater discharge in accordance with national standards. The main focus of the Environment Protection Department is on the coking plants. The department is dependent on pollution discharge fees (8 percent of collected fees) and excessive discharge fines (75 percent of collected fines) to supplement its budget. Eighty percent of pollution discharge fees collected are returned for environmental control. Government funding supports 9 of the 35 personnel, and 42 percent of the department staff have high professional educational qualifications.

Land and Resources

A.4.8 The Qingxu Land and Resources Bureau was established in January 2002 by combining the former county land department with the geology and mineral resources department. The bureau has nine divisions including an administrative office, planning, arable land protection, land use, cadastral management, law enforcement and supervision team, mineral resources management, finance, and political. The bureau also has four public service units including a real estate development company, town land management office, land reserve development center, and land evaluation center.

A.4.9 The bureau has a staff of 67 of which 28 are fully funded by government appropriation; the rest are supported from land fee income submitted to the county government. Approximately half of the staff has high professional education; the remainder have high school or middle-level professional education.

A.4.10 The mineral resources section has a staff of six whose main duty is to check on mine reserves and determine by comparison of surface and underground measurements if workings extend beyond permitted boundaries. The Land and Resources Bureau collaborates with the Work Safety Supervision Bureau to penalize any violators.

Example Township Mine

A.4.11 Xiliangquan is a typical, middle-level township mine in Qingxu County with a capacity of 90,000 tpa that produced 70,000 tons of coal in 2002 from three drill and blast room-and-pillar sections. The mine uses timber supports. The mine started operation in 1979 with an initial production capacity of 30,000 tpa and a total investment of 300,000 Yuan (not including partial labor contributed by the village). The mine was partly financed by the village and partly from a loan. The mine capacity was expanded to its present capacity in 1987. The mine has remaining reserves of 3.6 million tons and another 15 years of service life. The coal type is anthracite, the coal production cost is 70 Yuan/ton, and the mine-mouth price is 90 Yuan/ton, which are both very low. The coal is sold to a nearby coal preparation plant and is transported by truck. In addition to meeting operating costs and financing new equipment, the profit of the mine is used to provide welfare for the village of 1,800 inhabitants.

A.4.12 There are 153 miners, and the director of the village is also the director of the mine. The miners are mainly farmers from Shaanxi, Sichuan, and Hubei, some with high school education others having only primary school education. The average monthly salary of miner is about 1,000 Yuan.

A.4.13 The county urged the mine to install a gas monitoring system, which it did in the beginning of 2003 at a cost of 150,000 Yuan, a substantial sum for this relatively low-cost operation. The underground methane concentration and ventilation fan operation can now be monitored at the control room on the surface. The safety and efficiency of the mine is limited by the low capability of miners, an itinerant workforce, and obsolete equipment.

Xintai City, Shandong, Coal Mining Administration

Introduction

A.4.14 Xintai City is under the jurisdiction of Tai'an City and is a resources-based, county-level city with coal as its main industry. The city covers an area of 1,900 square meters, with a population of about 1.34 million. The gross domestic product reached 12 billion Yuan in 2002. Local fiscal revenue was about 500 million Yuan, of which coal industry accounted for 50–60 percent. Xintai City has a total of 1,100 public servants, 80 percent of whom have university-level education.

A.4.15 Xintai City has 29 mines with a total annual production of about 3.6 Mtpa; production at individual mines ranges from 600,000 tpa to 60,000 tpa. There are 85 Mt of potentially recoverable reserves. Coal in the region has high sulfur content. The average mine service life is 26 years, with the maximum being 36 years. Three of the mines are former SOCMs, 7 are city and town jointly invested mines, and 19 are township mines. The average coal production costs are 100–120 Yuan/ton and the sales price is 200 Yuan/ton. The main customers are power plants within the province. There are no private mines as private companies are permitted only to contract, subcontract, or lease a coal mine in Shandong Province.

A.4.16 Some 15 mines are facing exhaustion of reserves and may close within the next three to five years. Xintai City has closed seven mines in recent years because of resources depletion. Personnel from SOCMs were reemployed in other mines but staff in township mines were dismissed and returned home; there was no compensation for the mine closures.

Work Safety Supervision

A.4.17 Xintai Work Safety Supervision Bureau has 12 staff, 1 director, and 2 deputy directors. Since 2001, all the mines in the city have been rectified after stopping production to upgrade safety facilities. As a result of initiatives to raise safety awareness, and to increase individual and collective responsibility for safe working, no accidents have so far been recorded this year.

A.4.18 The new approach to safety responsibility involves grasping the “two bases” of work (grassroots and base) as the core, with both households and the district team guaranteeing to develop a good atmosphere in which everyone attaches importance to mine safety. The safety culture is aimed at “having safety culture going deep into people’s heart.” An investigation system for hidden risk (presumably inrush precautions) was established in 2002 in accordance with the requirements of the Shandong provincial government.

Coal Industry Bureau

A.4.19 The Xintai Coal Industry Bureau is part of the Xintai local government. The approved staffing level is 21 persons but currently only 9 staff are responsible for the administration of 29 mines with a monthly budget of 5,000 Yuan. A newly established mine safety law enforcement team is attached to the Coal Industry Bureau, with an approved staffing level of six to seven. In addition, Xintai City has introduced 2 to 3 safety inspectors to each mine, 70 persons in total, and they are not included in the approved staffing levels. It is not clear what powers these inspectors have or their relationship to the Work Safety Supervision Bureau. There seems to be overlap between the safety law enforcement team and the Work Safety Supervision Bureau.

Land and Resources

A.4.20 The Xintai Land and Resources Bureau has an approved staffing level of 35 persons more than 80 percent of whom have university-level education.

Environmental Protection

A.4.21 Xintai Environmental Protection Bureau has about 25 staff, more than 80 percent of whom have university-level education.

Example Township Mine

A.4.22 Wennan mine is owned by the Xintai Wennan township and has operated for over 30 years and has a remaining life of some 25 years. The current design capacity is 210,000 tpa. In the first half of 2003, coal production reached 117,500 tons from two mechanized coalfaces. The average sales price is 180 Yuan/ton (the price is a little low due to a high sulfur content of up to 2.8 percent) and the main customer is the county power plant.

The mine realized approximately 3 million Yuan profit after tax. Currently, the mine has 1,277 staff, of whom 440 are underground miners with an average monthly salary of 800 Yuan.

A.4.23 The mine claims an excellent safety record. The mine has carried out the household and district team's joint guarantee mentioned above. Before entering the mine, staff, led by the district director, swears in front of the group photo of the district team. In the event any miner disobeys the rules, other team members will share the responsibility, and the miner's family members are required to pay the fines. As a result, zero accidents have been recorded in recent years.

Dongqu Mine, Shanxi, Environmental Impact and Reclamation

A.4.24 Dongqu mine produces a large amount of waste because of the high ash content of the coal, and efforts have been focused on reducing the environmental impact of tipping. The Dongqu mine is located 100 kilometers west of Taiyuan and is operated by Xishan Coking Coal Group. The mine has a designed capacity of 4 Mtpa and was put into operation in 1991. The coal production is small because of railway transport restrictions. Up to the end of 2002, the accumulative coal production of the mine was 10 Mt. The mine produces low-sulfur and high-ash coking coal. In 2002 some 2.50 Mt of coal and about 1.0 Mt of waste was produced. The waste pile of Dongqu mine is located in Changyugou gully, 10 kilometers away from the mining area, and it covers an area of 23.5 hectares. To prevent the waste pile from spontaneously combusting and polluting the air a specialized waste treatment team of 40 staff was established in 1998. The coal waste is transported from the coal preparation plant to Changyugou gully at a cost of 8 Yuan/ton of coal waste, and the coal waste treatment cost is 2 Yuan/ton. The treatment involves placing and compacting the coal waste in layers and covering it with yellow soil. Since 1995, 190,000 tons of low-heating-value coal and 18,000 tons of lump coal has been recovered, creating a direct economic benefit of 9 million Yuan. The yellow soil cover totals 150,000 cubic meters and the reclamation area is 30,000 square meters. A total of 20,000 trees have been planted on the waste and an area of 18,000 square meters greened. Agricultural crops occupy 10 mu (6,667 square meters) and 2,000 head of animal are bred. The original bare hill has developed into a landscape with birds, flowers, green trees, and a comprehensive development project integrating coal waste recovery, vegetation, animal husbandry, and planting.

Feicheng Mining Area, Shandong, Environmental Impact and Reclamation

A.4.25 The Feicheng coalfield is located at the western base of Taishan Mountains, covering an area of 98 square kilometers (146,900 mu). Currently there are seven active mines in the mining areas producing about 6 Mtpa. The cumulative coal production in the mining area has reached 1.7 billion tons, and the cumulative taxes and profits subscribed to the state have amounted to more than 2.0 billion Yuan.

A.4.26 Because of the shallow groundwater level of 1.5–2.5 m, some farmland becomes unproductive after coal is mined. From the start of production in 1958 to the end of 2002, coal mining subsidence has affected an area of 47 square kilometers (70,620 mu) of

which nearly 60 percent was productive farmland. Some 17 percent of the farmland has been compensated for and only about 3 percent has been reclaimed for agriculture, housing, and coal-related village redevelopment. Fly ash has been used to backfill areas for village redevelopment enabling local residents to develop fishing ponds, plant lotus, and develop animal breeding on the reclaimed area. Following the State Council Order 79 “Regulations governing land reclamation” in 1988, Feicheng Mining Group has sought to occupy less farmland and quality land. Despite internal financial limitations, by the end of 2002 the group reclaimed a total of 1.5 square kilometers (2,265 mu) of subsided land at Dafeng, Taoyang, Chazhuang, and Bazhuang mines at an average cost of 45 Yuan/square meter (30,000 Yuan per mu or US\$5.4/square meter).

Tianchi Mine, Shanxi, Consolidation and Transformation

Introduction

A.4.27 Tianchi mine is located in Heshun County, Jinzhong municipal region, Shanxi Province. Heshun County lies in a mountainous region bordering on Hebei Province. It is situated in the eastern part of Shanxi with Yangquan City as its economic center. Its remoteness is exemplified by its use as a guerilla base during the anti-Japanese war (1937–45). Heshun County has a population of 134,000 and covers an area of 2,350 square kilometers. The main industries are coal mining, chemicals, and construction materials with relatively weak farming and forestry industries. Heshun is a poor county, but with relatively rich coal resources and simple geology. Some 59 percent of the total area is coal bearing. Of the coalfield areas, about 24 percent have been exploited. The resources are estimated at 3,450 Mt. Coal mining and sales provide 70 percent of the county’s tax revenue. In fact, from January to September 2003, 86 percent of the county’s income came from coal mining, transport, and sales. In 2002, the income to the county was 57.8 million Yuan, the average income of a country dweller was about 1,500 Yuan, and the average disposable income in urban areas was about 4,300 Yuan. The net annual income in the region of Tianchi mine is 1,708 Yuan. Tianchi colliery lies in Guyao Village of Weima Town, 17 kilometers from the southern part of Heshun County and 3 kilometers away from national highway 207. It is 28 kilometers from Zuoquan County in the south and 150 kilometers from Xingtai City in the east.

A.4.28 The mine will be developed to access geological reserves of 145 Mt, of which 94 Mt are recoverable, by extending and upgrading two of the drift entries of the small, state-owned Guyao mine and the Dalianggou mine and sinking a new ventilation shaft. The new mine will have three fresh-air intakes and one return. The main seam to be mined is No. 15 at a depth of about 200 meters below surface. No 3 seam will also be worked. The designed production capacity of Tianchi is 1.2 Mtpa.

A.4.29 Planning has been completed, and construction is about to start. The original small mine (Guyao) started operations in 1956 with an initial capacity of 60,000 tpa and was subsequently upgraded to 150,000 metric tons per year. Construction of one drift of Dalianggou mine had been started prior to the takeover with the intention of increasing production by a further 21,000 tpa. The workings of the original small mine will be sealed

off. Resource recovery from the nonmechanized small mine was at best 30 percent compared with the 85 percent planned from the new fully mechanized longwall operation. Yankuang Group is financing the 260 million Yuan development and will bring the necessary technology and expertise into the county.

A.4.30 Tianchi mine was formed by restructuring three small mines, Guyao, Shangyuan, and Houyaodi, which belonged to the state-owned Guyao coal group of Heshun and Jinzhong. Tianchi mine is owned by a limited company, Shanxi Heshun Tianchi Energy Co. Ltd., in which Yankuang Group has a controlling interest through its Yankuang Shanxi Energy Chemical Company, which holds 81.13 percent equity. The remaining shareholders are Heshun County Guyao Coal Enterprises Group and Jinzhong Municipal National Property Operational Company, both local government-owned enterprises. The shareholdings of the latter two parties were bought for 19 million Yuan. This did not involve any cash injection as it matched the 46 million Yuan value of the assets, less a 27 million Yuan debt owed to others. The registered capital is 90 million Yuan.

A.4.31 Tianchi mine represents a model example that will introduce modern mining technology, expertise, and skills to the county; improve worker safety; reduce wastage of coal resources; ensure responsible environmental protection; and facilitate economic growth within the locality.

A.4.32 The county government and Party officials recognize the importance of the Yankuang investment to the county and to the local community, and there is close liaison between all local government parties.

Coal Sector Administration Procedures

A.4.33 The acquisition of a small mine by a larger company for expansion involves concept approval, undertaking a feasibility study, approval by the provincial government, and referral to the NDRC if the annual capacity is greater than 0.6 Mtpa. The fact that government policy is aimed at encouraging large mine development only effectively means all new coal mines must be approved at the state level by the NDRC. This step is delaying the mine reconstruction process at Tianchi. There would be a positive advantage in allowing for all approvals to be completed at the provincial level. Details of coal mine approval processes have already been described in a previous report (Mitsubishi Research Institute [MRI] 2003). A policy goal highlighted in the MRI report was to decentralize decisionmaking to reduce bureaucracy and reduce the inefficiencies in handling applications. The case study provides a reminder of this need.

A.4.34 The case study mine has completed all the relevant provincial and local approvals for construction and awaits NDRC approval to commence. Unpredictable delays while awaiting approvals is still a matter of concern to both domestic and foreign investors in mining projects. Transfer of the mining licence to the new operating company was procedural and completed without difficulty.

A.4.35 A Sino-foreign investor would have had to follow the same procedures as Yangkuang Group. As the investment cost of Tianchi (about US\$26 million) was less than

the US\$30-million threshold for MOFCOM approval required for foreign investment this additional time-consuming step would have been avoided. However, use of more costly foreign equipment would have pushed the cost above the limit. Such criteria are inappropriate if they discourage introduction of modern equipment to raise safety and productivity.

Management and Personnel

A.4.36 The management structure at Tianchi is similar to that of other modern KSOCMs. The difference is that the senior staff at this mine might expect a degree of autonomy as the mine is not directly managed by the Yankuang Group, but by a new company based in Heshun County.

A.4.37 The management team will include 17 appointees from Yankuang Group. Five of the senior management staff are from Yankuang and one is local. Local mid-level management staff are being retrained by Yankuang and of the 30 staff at department level, 20 are from Yankuang. The influx of experienced staff will ensure workers are trained properly and the mechanized systems are operated safely and efficiently. A veteran production team of 80 workers and staff, comprising two squads, from one of Yankuang's mines will train the local production personnel in mechanized mining techniques. As Yankuang has no experience in operating gassy mines, retired experts from the neighboring Yangquan mine will be hired as technical consultants. Yangquan Group is a KSOCM with a good track record until August 2003 when a serious explosion occurred at one of its mines killing 28 miners.

A.4.38 The small mine employed a workforce of 450 producing 150,000 tpa. Tianchi will employ 650 (including surface and underground workers) to produce 1.2Mtpa, a fivefold increase in productivity.

A.4.39 The agreement for the takeover of the small county-owned mine included a requirement for all the full-time workers to be transferred to the new company. Of the 450 workers at the small mine, 240 were on long-term contracts and these were transferred. The remainder were temporary workers on short-term contracts and they were laid off. Those from other provinces are expected to return to their homes. However, there is a danger that out of desperation they may turn to illegal mining. Once Tianchi comes into production, the mine has made a commitment to the local government to offer any new jobs to the former temporary workers first before recruiting externally.

A.4.40 While there may be social reasons for maximizing employment, overstaffing or the employment of unsuitable staff will lead to inefficiencies that could compromise the sustainability of the mining enterprise. Nevertheless, these staffing levels represent a significant improvement over those in the long-established large mines such as in Northeast China where there can be more than 3,500 employees per Mt of coal mined.

A.4.41 High-level managers are paid a salary and an annual bonus, production workers are paid on a piece-work rate, and production support personnel are paid a basic wage plus an assessed bonus. Worker salaries will be the highest in the county once the mine

attains its design production. Since last August, the average salary has been raised by 150 Yuan/month. After deduction of pension and medical insurance a worker can expect to earn 10,000 Yuan per year, at least six times more than might be expected at a small mine. A scheme for attracting graduates to the mine is currently being developed.

Coal Mining Technology and Coal Preparation

A.4.42 The Guyao county-owned mine was nonmechanized and worked by a type of room-and-pillar method. A 60-meter face was worked using drill and blast techniques and retreated for 25 meters. A 15-meter pillar was left and the process repeated. Timber supports were used, and the mining method ensured that no caving occurred. It was wasteful in terms of resource recovery but offered safety benefits as it was ventilated like a shortwall system; the pillar arrangements prevent caving thus ensuring reasonable roof conditions and limiting gas release to the worked seam only. The county authorities are putting considerable effort into ensuring the safety of small mine operations, as the local economy depends on them, until new large mine replacement capacity can be introduced. Despite these efforts, the statistics show that small mines are on average still the most dangerous workplaces in the coal mining sector.

A.4.43 Yankuang has developed a successful method for mechanized mining of thick seams in a single pass as a cost-effective alternative to longwall slicing methods. This longwall top coal caving (LTCC) method is being considered for application at Tianchi where No. 15 seam ranges from 3.7 meters to 5.6 meters thick and a coal recovery of 85 percent is required.

A.4.44 The slicing method, around which most thick-seam mines were previously designed, is used to extract the full section of a thick seam in a sequence of two or three slices of up to 3.0 meters in height, commencing in the uppermost portion of the seam. The method involves standard longwall practice, but modifications to facilitate the spreading of wire mesh along the face, which is trapped against the roof by the hydraulic face supports as they advance. The mesh is left behind in the goaf to form a boundary between broken waste rock and the remaining coal in the floor of the seam. After consolidation of the goaf, a new panel is established on a lower portion of the seam beneath the previously extracted panel.

A.4.45 The LTCC method has been widely used in recent years. The method involves the extraction of a single panel in the lower portion of a thick seam in which the top coal is allowed to cave without the use of mesh. The roof supports are of a modified design incorporating a system of hydraulically operated tail-canopies at the rear of the support that can be moved up and down to allow broken coal in the goaf area to spill onto a second armored face conveyor. This process is allowed to continue until all retrievable coal behind the face has been collected and waste rock appears. A typical LTCC face can produce 15,000 to 17,000 ton/day achieving 75 percent recovery of an 8-meter seam from a 3-meter-high face, and 5 Mtpa output. The Tianchi seam is less than 6 meters thick, and a resource recovery of 85 percent is anticipated.

Development of Mine Design and Its Approval

A.4.46 Yankuang has its own design institute but is still constrained by the current outdated design rules (Experts Group 2002). The design rules require a 1.2 Mtpa mine such as Tianchi to have a life of at least 60 years. A capacity of 1.2 Mtpa and recoverable reserves of 94 Mt gives Tianchi a life of 78 years, which safely meets the prescribed criterion and presumably allows for a future increase in production to 1.6 Mtpa. To tie up coal reserves for a period of more than 30 years would be considered inefficient in developed coal mining countries.

A.4.47 Longwall panels will be developed with multientry systems using roadheaders. Longwall faces in No. 15 seam will be 180 meters wide and panels 1,800 meters in length. These faces are modest in width compared with modern high-production mines in other countries where face lengths of 250–300 meters are more common. Tianchi mine will be equipped with Chinese manufactured machines and fittings. No. 3 seam will be mined using conventional longwall drill and blast methods. The mine is classified as highly gassy. The expected gas emission from mining No. 15 seam is 5–15 cubic meters/minute, increasing to 15–30 cubic meters/minute as workings progress deeper. In international terms the mine would be considered moderately gassy. Methane drainage is generally required for gas flows in excess of 18 cubic meters/minute. Gas drainage and a remote environmental monitoring system will be installed at Tianchi in compliance with Shanxi's safety regulations.

Training and Technical Support

A.4.48 Yankuang will bring a team of skilled technical engineers to the mine. Higher than usual salaries will be also offered to attract young graduates. The original workers have no experience with mechanized mining, and retraining may be difficult. Nevertheless, 258 of the original mine's staff and workforce will be retained, with the total complement for Tianchi being 658.

Coal Preparation and Coal Quality Standards

A.4.49 The coal mined at Tianchi is low ash but with medium to high sulphur. The coal is of low volatile rank but later mined seams are anthracite. The claimed heat value of coal is 6,200 kilocalory/kilogram (26.0 megajoule/kilogram) but this high value is probably measured on a clean sample and is not likely to be representative of run-of-mine coal. The total sulphur is about 1.5 percent of which half is inorganic sulphur. Initially, when the shallower, lower sulphur coals are worked coal processing will be limited to vibro-screening to grade the products. Stone will be removed by hand picking. Coal blending and washing facilities will be added at a later date. The expected water usage of the coal washing plant would be 3,000 cubic meters/day of which 2,000 cubic meters/day would be treated and recirculated, the balance coming from a nearby water source. Water is a scarce resource at Tianchi and in many other coalfield areas in China. However, with modern technology and careful management coal washing should be practicable at most sites. No coal washing facilities for sulphur removal would have been constructed at the former small coal mines. Coal washing and hence improved coal quality is an important step for reducing pollutant

emissions when coal is burned. While large industrial users can clean stack emissions, improved fuel quality is needed to reduce the serious low-level emissions from domestic stoves. The problem is persuading domestic users to buy more expensive, cleaner fuel.

Health and Safety

A.4.50 Miners will only pay serious attention to safety once they can satisfy their basic requirements for food and clothing (Maslow 1970). Raising the living standard of miners in poor areas such as Heshun County will increase their desire for safer working as will the raising of educational standards.

A.4.51 Increasing production efficiency through mechanization significantly reduces the number of men at risk per unit of coal mined. Guyao mine produced 150,000 tpa with 450 staff and workers, whereas Tianchi will produce eight times more coal for a 1.4-times increase in numbers of employees. Use of safer, mechanized equipment should also reduce the risk to an individual (measured by the number of accidents relative to the number of man-shifts worked).

A.4.52 Safety improvements in the new mine compared with the former Guyao mine include an improved ventilation system, dual power supply to reduce the risk of hazardous ventilation stoppages, replacement of timber roadway supports by bolts, mesh, and shotcrete, and a comprehensive safety monitoring system.

A.4.53 The economic condition of Tianchi mine is not the same as that of the other Yankuang mines, there being a difference in profit of about 50 Yuan/ton. It is important that this difference does not lead to any weakening of the safety management system or the safety technology employed at the mine.

Safety Training

A.4.54 Training is an important part of the work of the State Administration of Work Safety (SAWS) both for capacity building among safety inspectors and industrial safety training for management and workers. A total of 21 national training centers have been established with 8 specifically focusing on mine safety. SAWS recognizes there is much to be learned from the international community, and these centers are encouraged to establish international collaborative links. There are also approved safety training centers at the local level. Yankuang's mine managers are trained at the national training center and mineworkers are trained at mine-based training centers. Because of the increasing training requirements at mines, mining companies have not had time to recruit, train, and examine the qualifications of all the mine-based trainers. This process will be completed in 2003 within Yankuang Group. Tianchi mine will establish and operate a training and education office. The new workers will be required to attend a seven-day training program and pass an examination before commencing work. Ten percent of their salaries will be related to their grades. Personnel training scholarships will be offered to raise the capability of mid-level staff. Small mines do not have the resources, knowledge, or motivation to engage in training and training support schemes.

Safety Standards

A.4.55 State mines judge their safety performance against national safety statistics for similar mines and are generally satisfied if they do not exceed this parameter. The parameter usually quoted is fatalities per Mt of coal mined. Some mining groups, such as Yankuang, have much higher safety performance indices than the average. The provincial government set a safety management index of not exceeding 0.35 fatalities per Mt of coal production for 2003. Yankuang has set an internal target of not exceeding 0.30, and from January to September 2003 achieved 0.029 fatalities per Mt compared with 0.145 per Mt in 2002. In comparison, the average for all mines in China was 4.88 fatalities/Mt in 2002 and 1.26 fatalities/Mt for the KSOCMs while the figure for the United States was 0.03 fatalities/Mt.

A.4.56 Yankuang attributes its results not only to improved management but also to the fact that most of its mines are not gassy. Tianchi is the first gassy mine it will operate. Gas drainage and gas control skills may be imported from the neighboring Yangquan Mining Group in Shanxi. The group's technical and research institute has been given the task of researching and developing effective gas control measures. Research and development facilities are only supportable by large mining companies and help to introduce innovation and accelerate improvement in performance and safety. Small mines are not able to finance research and development and have little interest or ability in technological innovation. A coal mining sector consisting mainly of large enterprises is therefore likely to introduce new ideas and technological developments compared with one dominated by small mines. Removal of prescriptive design rules would aid this process and accelerate modernization of the coal sector, increased efficiency, and better economic performance.

A.4.57 Yankuang is also constructing a mine in Guizhou which, like Tianchi, will be gassy when working starts. A greater hazard is anticipated, and the group is resigned to a lower safety index but is confident that it will be still within the national standard. This attitude is common to all state-owned mining enterprises in China and contrasts with the philosophy applied by major coal mining companies in developed countries. In countries such as the United Kingdom, Australia, and the United States national accident statistics are not considered as an expression of an acceptable level of risk but as a minimum that must be improved on with the ultimate aim of consistently achieving zero fatalities. Companies in these countries recognize the high financial cost of accidents, that safety and profitability are linked, a moral obligation to protect worker safety, and the importance of demonstrating to public and national governments that they operate in a responsible manner. Legislation is less prescriptive than in China and essentially puts the onus on mine management to use their experience and initiative to develop best practicable means of achieving safe working. Yankuang has introduced mechanisms, such as the workers' safety mortgage scheme and remote monitoring technologies, which could enable it to maintain its current high safety standards in its new gassy mines, including Tianchi. The concept of using best practicable means, if introduced in legislation, would assist the cause of raising safety performance of mines in China to a higher level.

Gas and Water Risks

A.4.58 In 1996, a gas explosion at Guyao caused 15 fatalities. In the ensuing years from 1997 to 2001 another five deaths occurred. The average fatalities in coal mines in Heshun County from 2001 to 2002 were 2.4 per Mt mined. The fatality indices for 2001 and 2002 of 3.6 and 1.3 are lower than the Shanxi averages, clearly indicating the greater attention paid to safety in small mines in Heshun County.

A.4.59 Tianchi mine will face gas hazards and possible water incursions from karst features in limestone strata. Gas control measures will be implemented, including gas drainage. Water inundation protection measures at Tianchi will involve monitoring water levels in neighboring small mines, hydrological testing of the Ordovician limestone, monitoring water percolation through faults, dewatering using underground pumps, and designing the mine to enable areas to be isolated with watertight doors. Consideration should be given to transferring technical specialists versed in dealing with water and gas issues to strengthen the management team. Research and development on gas control being undertaken by the Yanzhou research institute and advice from retired Yangquan mine gas specialists will complement this effort.

Safety Mortgage System

A.4.60 Mine officials pay a sum of money, dependent on their rank, into a scheme that pays a bonus equivalent to their deposit if accident-free records are maintained, but financially penalizes them in the event of an accident. The fine increases with the severity of the accident. This is an effective measure as any loss of income has a heavy impact on family welfare. This approach also helps to engender the concept of collective responsibility. The highest-level officials deposit 7,000 Yuan each and lower-level officials deposit 70 percent of this sum.

Accident Reporting

A.4.61 An accident reporting system has been implemented in the safety management system of the mine. A minor injury is required to be reported within 24 hours and the details placed on file within 7 days. If three or more persons are severely injured, the local safety inspection branch and the provincial coal industry bureau control center must be notified.

Occupational Health

A.4.62 Yanzhou Mining Group (wholly owned by Yankuang Group) has established an occupational disease prevention and treatment center. Employees are examined annually. From 1999 to 2002, 72 cases were detected, only one in the second of three stages, the remainder in the first stage. Improvements in the prevention of lung diseases in recent years are attributed to use of dust protection measures including water sprays, water infusion of the coal seam, wet-drilling of blast holes, and use of dust masks by workers. Similar measures will be applied at Tianchi. A large mine that monitors health can change the tasks of workers at the first signs of distress to reduce the chances of the disease reaching a chronic or debilitating stage. Workers in small mines probably have a significantly greater exposure to dust than those in large mines because of lack of knowledge of dust control measures. The

likelihood of the disease developing to the serious stage will also be much higher as the workers are not screened. In the absence of data for the small mines, health statistics for the coal mining sector are therefore likely to be substantially understated. In addition, the health monitoring at the KSOCMs is probably not used to best effect. The Ministry of Health (MOH) is responsible for health monitoring and statistics but does not break down coal sector data into mine types. Neither does it seem to distinguish between silicosis and pneumoconiosis. While the provincial SAWS receives health statistics, the institutional links between safety (SAWS and SACMS) and health (MOH) administrations are too weak to enable the effects of health prevention measures in mines to be effectively monitored and improved.

Environment

A.4.63 Heshun County is mountainous with loess covered plateaus, hills, basins, and terraces. There are few industrial complexes, and the air quality is good. More than 40 percent of the area is forested or covered with green vegetation. The Shangyuan and Guyao coalfields in which Tianchi mine is situated lie in the western foothills of Taihang Mountain. The new mine development is located on a loess platform at an elevation of 1,360 to 1,390 meters above sea level. There are no rivers in the vicinity of the mine but during the rainy season the loess is eroded and ditches become deepened. Vegetation around the mine site consists mainly of scattered trees and shrubs.

A.4.64 A thorough environmental appraisal of the Tianchi project was undertaken by specialist institutes once the mine feasibility study was completed. The Jinzhong Environmental Protection Bureau monitoring station was asked by Taiyuan University of Science & Engineering to monitor environmental quality from March 23 to March 27, 2003. The weather bureau of Heshun County was entrusted with meteorological monitoring at both Heshun County and on the site of Tianchi coal mine for a period of one month (April 2003). These relatively short monitoring periods would not satisfy environmental and planning authorities in developed countries. Internationally accepted procedures would require conditions relevant to all seasons to be monitored. However, at least the principle of measuring baseline conditions has been established in China.

Table A4.1. Main Environmental Factors in Tianchi Coal Mine Extension

	<i>Air</i>	<i>Surface Water</i>	<i>Underground Water</i>	<i>Noise</i>	<i>Ecology</i>	<i>Landscape</i>	<i>Public Health</i>
Underground mining		?	?		?	?	
System of hoisting and ventilation				?			
Waste-water from production		?	?				?
Boiler room and shaft heating	?	?		?	?	?	?
Coal waste and slag	?	?		?	?	?	?
Truck transportation	?			?			
Key	? significant influence; ? medium influence; ? slight influence						

Source: China University of Mining and Technology

A.4.65 Through the analysis of possible environmental problems that could occur at different stages of development of Tianchi colliery (table A4.1), ecology, surface water, groundwater, and air quality were identified as the main environmental elements to appraise. The EIA established that with appropriate controls the expanded mine could be constructed and operated without making an unacceptable impact on the environment; that is, emissions of air, water, and solid waste pollutants could be controlled within national and local standards. Jinzhong Environmental Protection Bureau issued a consent that set the maximum permitted emissions of smoke, dust, and sulphur dioxide. It is unlikely that any check monitoring will be made given the limited resources of the local EPB so the onus rests with the mining company to satisfy the consent. While the KSOCMs take environmental protection seriously, strong enforcement is needed to ensure that all mines exercise their environmental responsibilities.

A.4.66 The detailed EIA was examined by experts at an appraisal conference and amended in response to their suggestions. This is essentially a peer-review process, not a public consultation as is common in many developed countries. The impact of the mining operations on the landscape, fauna, and flora and the nearby communities was considered with respect to noise, dust, groundwater pollution, air pollution, and solid waste disposal. Because of the dry, loose soil conditions, dust generation in the area is higher than average.

Screening of compounds and roads by trees will help to control dust from coal stocking and transport. Covering trucks and spraying water on the road will also reduce airborne dust.

A.4.67 An environmental management plan has been prepared by the mine to ensure that environmental protection issues are considered, monitored, and reviewed at all stages of the project.

A.4.68 The area will be exposed to subsidence once longwall extraction is commenced. Landslips are likely when steep loess slopes are destabilized, and some loss of farmland could occur exacerbated by soil erosion during heavy rainfall. However, these impacts will be controlled. For example, drainage ditches will be rebuilt if damaged and slopes stabilized by terracing and planting as appropriate.

A.4.69 The general manager of the mine is responsible for the environmental protection and land reclamation departments that have been established at the mine. The environmental protection department will have a section chief and three staff, and the land reclamation department a section chief and two staff. Duties of the environmental protection department will include monitoring of air quality, groundwater and surface water quality, water discharges, treated sewage, and noise. Coal picking will be carried out to minimize spontaneous combustion risks in mine waste. Leachates from mine waste and boiler cinder will be analyzed to assess their toxicity. Diversion ditches around waste and coal piles will minimize leaching. Waste will be deposited in valleys, covered with soil, and planted. A mine-water treatment plant capable of processing 6,000 cubic meters per day is planned.

A.4.70 As the new mine works deeper coals, gas emissions will increase and gas drainage will be started. Consideration should be given to using this gas in the colliery boilers as a clean fuel to replace coal burning and as a means of minimizing greenhouse gas emissions to the atmosphere.

A.4.71 Shanxi Environmental Protection Agency is the highest-level environmental authority to which Tianchi coal mine is accountable. It is responsible for approval of the environmental report, inspections, checking and supervising of the Tianchi coal project, and checking and acceptance of environmental facilities and pollutant controls. Jinzhong Environmental Protection Agency supports the provincial department. It is responsible for the supervision of the implementation of the environmental management plan and monitoring pollutant discharges and supervising any necessary remedial action. The local EPB does not have the staff, capability, or budget to undertake physical checks at mine sites. In the absence of checking, environmental bonds (as recommended in the MRI report, 2003), and strong enforcement, there is no motivation for mines to achieve high standards of environmental protection. The present procedures are largely paper exercises. On the positive side, the fact that the general manager at Tianchi has responsibility for environmental protection is in line with best international practice.

Environmental Benefits of the Large Mine Compared with the Small Mine

A.4.72 The difference between the environmental performance of a small mine compared with a large mine arises because the latter has the knowledge, ability, technology,

and financial resources to adhere to environmental regulations. For example, Tianchi has the funds and technological ability to undertake waste-water treatment although admittedly its water usage will be much greater than that of the original, small, nonmechanized mine. Water sprays in coal storage and loading areas will suppress dust. Investment in improved roads and communications will also reduce dust emissions and spillage from transport. Indiscriminate tipping of waste by the small mine without regard to environmental protection will be halted.

A.4.73 Coal will be hauled by truck to a new rail terminal to be constructed at Hanwang 3 kilometers from the mine. The buildings and stocking areas for the new mine will be constructed within the perimeter of the existing small mine. There will be no large coal stockpile as coal will be rapidly and efficiently moved out by rail. Most underground development will be in-seam reducing the volume of waste rock for disposal. Any waste will be used for valley infill, concentrated at a single site away from watercourses. Suitable material will be used for road construction and repair.

Environmental Pollution and Community Health

A.4.74 Shanxi has the highest incidence of birth defects in China. Environmental pollution is considered to be a contributory factor. Monitoring data from 1996 showed the national birth defect rate was almost 100 per 10,000. In Shanxi, however, the rate was about 190 per 10,000 on average. Thirty-nine counties had a higher rate of 200–400 per 10,000 and 13 counties had the highest rate of 400 per 10,000. A recent survey conducted in Heshun County shows that some 300 to 900 of each 10,000 newborns had congenital defects. Poverty, water shortages, and pollution problems afflict the area. Pollution from coal mining, adverse hygiene, poor nutrition, and lack of education have contributed to an anomalous incidence of birth defect problems. While environmental impacts of small mining coal operations and burning of low-quality coal in dwellings are not the primary causes, economic development aided by the introduction of industrial mining will help to alleviate such problems. This will be achieved through increases in income, opportunities to develop service industries, and the raising of educational standards among locals employed at the mine. A more responsible approach to environmental protection by large mines compared with small mines, and better control of coal quality, will benefit the overall health of local communities. An influx of educated engineers and technicians will also help to raise overall educational standards in the area.

Environmental Issues Relating to the Closed Small Mine

A.4.75 At Tianchi the new mine will be integrated with the workings of the old mine. Investigations show that the abandoned workings of the small mine are dry. However, a long-term monitoring plan should be prepared and implemented to ensure no unexpected gas and water accumulations occur that could create a hazard to the new mine. An abandoned surface entry to the old mine has collapsed and is securely gated. This entry should be demolished and the drift sealed to prevent any future uncontrolled seepage of hazardous gas to the surface. As the new mine occupies the site of the old mine, any residual environmental liabilities will be dealt with by the new company. Tianchi mine is a special case in that its

close integration with the former small mine workings ensures that it assumes responsibility for any inherited liabilities. However, where unconnected small mines are closed as part of a consolidation scheme, it would be unfair to burden the new large-scale operation with unforeseen liabilities. These should be borne by either the state or provincial government and appropriate laws and regulations are needed to facilitate this.

Economic and Social Aspects

Economic Performance of the Mining Group

A.4.76 Yankuang Group is the first domestic coal mining company to invest significantly outside its province of origin. If its ambitions to expand into other provinces can be successively realized, it can establish a model that could be more widely encouraged and followed in China. The attractions to local government are Yankuang's high credit ratings, internal financial resources, and the potential to benefit the local economy. The achievements of the local government can be measured in terms of its success at attracting such investment. The benefits to the mining enterprise are new reserves, an increased range of coal products, and a larger market share.

A.4.77 New large coal mines are planned by Yankuang in Shanxi, Shaanxi, Inner Mongolia, and Guizhou. The new mine developments in Shanxi and Guizhou in particular should assist local governments to successfully close some small mine capacity while maintaining coal output. This illustrates the important role of the main KSOCMs as major investors in coal sector rationalization.

A.4.78 Excessive government intervention is preventing the coal mining sector from realizing its full potential because of market interference. For example, the role and activities of Yankuang Group are subject to government scrutiny and influence. The board of Yankuang Group is required to adhere to government policy irrespective of commercial implications, and financing of new projects is dependent on provincial government approval.

A.4.79 The Tianchi mine will operate as a separate entity to Yankuang Group, not as a subsidiary. While some of the benefits of a large SOCM will accrue, the level of benefits enjoyed by the workers at Tianchi will very much depend on the financial performance of the mine. As Yankuang Group is a Shandong company, the provincial government there has little interest in interfering with an out-of-province operation. By relinquishing its majority shareholding, the local government has little power to intervene. The mine should therefore operate almost as if it were a private enterprise.

A.4.80 **Coal Market and Sales.** The output of Heshun County's coal mining area has averaged about 2 Mtpa in recent years. The highest yield was 2.8 Mtpa. The county itself consumes 0.5–0.6 million tpa; the remainder is mainly sold to Hebei and Shandong provinces. The main use of Tianchi coal is generating electricity. Power plants are its main consumers. Average coal consumption in generating electricity at the above power plants is about 0.37 kilograms per kilowatt-hour (standard coal at 29.3 gigajoule/ton). The average cost of generating electricity is 0.25 Yuan per kilowatt-hour.

A.4.81 **Market Price of Coal.** The feasibility of Tianchi mine was assessed on the basis of a predicted average coal price of 105 Yuan/ton. If prices continue to rise in Heshun County (table A4.2) the financial performance of the new mine will exceed expectations. Continuing small mine closures and rising coal demand may keep the coal price rising after the development of Tianchi mine. Leveling of market conditions by abolition of the energy construction fee (applies to SOCMs and TVCMs only) and removal of fees on coal sold to other provinces in 2005 will help to stabilize prices.

Table A4.2. Average Raw Coal Prices in Heshun County

<i>Year</i>	<i>Average Selling Price (Yuan per metric ton)</i>	
2000	66	
2001	83	
Jan–Oct 2002	107	
	Fine coal 85 Yuan/ton (67% of vend)	
April 2002	Large and medium block coal 165 Yuan/ton (33% of vend)	111
	Fine coal 115 Yuan/ton (67% of vend)	
	Medium lump coal 180 Yuan/ton (15% of vend)	
Oct 2002	Large lump coal 210 Yuan/ton (18% of vend)	142
	Fine coal 88.7 Yuan/ton (75% of vend)	
Appraisal prices (feasibility study)	Large and medium lump coal 154 Yuan/ton (25% of vend)	105

Source: China University of Mining and Technology

Positive Impact of Coal Mining Activities on the Local Community

A.4.82 The local economy will benefit from mine and infrastructure construction and operation. A new nearby railway, which has a design capacity of 17 Mtpa and currently only carries 7 Mtpa coal, will gain new business. A 6-kilometer-long, 80-million Yuan road will be built from the mine to the main trunk road and railway. Provision of construction materials will enhance activity in local quarries, cement and lime plants and road transport companies. As a precautionary note, extensive indiscriminate quarrying can be observed in Shanxi with little regard for the environment, slope stability, and efficient exploitation of mineral resource. This topic requires further research and is outside the remit of this study.

A.4.83 Local mineworkers will have improved working conditions, better health, safety, and hygiene, less physically arduous tasks, and a higher income than was possible with the small mine. Welfare provisions include health, unemployment insurance, and pensions; thus, the miner's families will benefit. Health screening and the availability of medical services will ensure better health among the local workers.

A.4.84 As the number of small mines is reduced and mining is concentrated at a few well-managed and monitored sites, water and ground pollution will be reduced. Coal haulage will be concentrated mainly on short-haul roads and greater use made of rail transport. On balance there will be a positive environmental gain.

A.4.85 The nearby Guyaokou Village will benefit considerably from the increased spending power of miners and provision of services to the mine. The 650 workers at Tianchi will bring 6.5 million Yuan into the community, some to the village and some to the county town. Prior to takeover the disposable income of the miners was about 0.8 million Yuan. The increase of 5.7 million Yuan will stimulate the local secondary economy including development and expansion of service industries, restaurants, and quality housing. A local restaurant owner with a business in Heshun's main urban center has already returned to Guyaokou Village to start a new venture in the village adjoining the mine. The earnings of the Tianchi miners will represent about 2 percent of the wages and salary income of the whole county (assuming a countryside population of 100,000 earning an average of 1,708 Yuan/year, an urban population of 34,000 earning 4,300 Yuan/year, and miners earning 10,000 Yuan/year).

A.4.86 At an estimated average coal sales price of 105 Yuan/ton, an annual revenue of 126 million Yuan is anticipated of which some 29 million Yuan will be paid in local taxes. VAT paid to central government is calculated at 13 percent of sales minus 17 percent of external materials costs and will amount to about 4.3 million Yuan. The predicted economic performance of Tianchi before and after transformation is compared in table A4.3. A greater than five times increase in productivity and a more than a nine-fold increase in profit is notable.

Table A4.3. Comparison of Expected Economic Performance, Tianchi

	<i>Before Reconstruction</i>	<i>After reconstruction</i>
Coal production (megaton)	0.15	1.20
Coal price (Yuan/ton)	105	105
Annual revenue (million Yuan)	16	126
Output per man day (ton/person)	1.8	10
Annual local sales tax and surtax (million Yuan)	2.1	16.6
Annual total profit after tax (million Yuan)	2.6	24.9
Enterprise income tax (33%) (million Yuan)	1.3	12.3
Incremental rate of return after tax (%)	0	16

Source: China University of Mining and Technology

A.4.87 The revenue and secondary economic benefits will assist the modernization of Heshun County. For example, the main street of the county town is being redeveloped with modern buildings, and infrastructure is under construction. Had small mine closures been forced with no large new mine to replace lost revenue, the infrastructure program would have been halted.

Small Mine Closures

A.4.88 Currently, there are 58 small coal mines in Heshun County producing a total of about 2.4 Mtpa. The county government aims to progressively close these mines as new large mine production comes on-stream. Seven small mines were closed last year and five will close this year. The planning of small mine closures is an administrative process based on phasing out the lowest capacity mines first. Provinces have set minimum capacities for permitting new mines, and local governments are applying these criteria. There would appear to be a degree of discretion in timing closure. In the case of Heshun the establishment of new large capacity mines is the determining factor. This stance is not acceptable if safety is compromised.

A.4.89 Coal is the mainstay of the county's economy, and this clearly influences small mine closure policy. The local leaders have decided the route to survival is by strengthening the coal mining capability of the county. They recognized that small mine operators had neither the skills to expand mining in a safe and efficient way nor the contacts to cultivate interest from major investors and large mining companies. The local county leaders therefore decided to take the initiative and approached various large coal enterprises to invite their participation in exploiting the county's coal reserves.

A.4.90 The strategy of the county government is to:

- Replace small mines with large, safer, more efficient mines, maintain county revenues, and reduce wastage of coal resources.
- Progressively order the closure of small mines as large mines are opened so coal output does not grow too rapidly and destabilize coal prices.
- Identify a responsible, large mining investor who could finance expansion, introduce advanced technology, attract other industries, and replicate a successful transformation of a small mine to a large mine at more than one site.

A.4.91 An important aspect of the local government's strategy, exemplified by Tianchi mine, is that it is prepared to relinquish control of a former SOCM to a third-party operator, retaining only a minority share representing the value of the mine at takeover. Thus local government interference in coal mining operations is being reduced.

Future Developments

A.4.92 Discussions are in progress with Yankuang Group and Jinzhong Coal Transport Co. regarding a possible additional new mine project at Fuyang to replicate the

Tianchi model. This could duplicate the benefits shown at Tianchi to Heshun County. The combined coal production of the two large mines would then match that of the 58 small mines, which could then be closed without detriment to the fiscal income of the county. However, there would be redundancies of some 5,900 miners (estimated on a pro rata basis from the Tianchi small mine assuming 450 miners per 0.15-Mtpa capacity of small mines, 58 mines, 2.4 Mtpa; 650 miners per 1.2-Mtpa capacity for each of the large mines). The total spending power of employed miners within the county would be largely unchanged (fewer miners but higher wages) but the wealth would be concentrated around the two new mine sites. To alleviate unemployment and deter illegal mining, additional investment in creating new, sustainable jobs would be essential. The options are to expand coal mining further, develop other sectors, or a combination of the two. The local government plans to develop the chemical sector and is encouraging Yankuang Group to invest in coal-chemical projects.

A.4.93 The lesson from Tianchi is that Shanxi Province should actively encourage investment by mining enterprises from other provinces in the consolidation and transformation of small mines. Local governments could set up information centers to assist developers to identify both suitable resources and prospective small mine partners.

Shungliu Mine, Shanxi, Consolidation and Transformation

Introduction

A.4.94 Shuangliu mine lies in Liulin County, Shanxi Province. Fenxi Mining Group came to Liulin seeking to expand its coking coal resource base in 1998 and purchased the small mine that occupied the site, investing 450 million Yuan to extend it from 30,000 tpa to a 1.5-Mtpa operation. The lease area was increased from 1.3 square kilometers to 30 square kilometers thus raising the accessible reserves in the combined No. 3 & 4 seam from 3 Mt to 120 Mt. This gives the mine a notional 80-year life, which would be considered too long to tie up reserves by licensing authorities in developed countries. However, it is consistent with current, outdated mine design guidance in China that must be followed to obtain SDPC and NDRC approvals. Further coal resources are available in deeper seams. At present the mine has one fully mechanized, 3.5-meter-high face and one partially mechanized longwall. Coal production reached 0.95 Mt in 2002 and is projected to attain 1.45 Mt in 2003. Current plans are to expand to produce 2.2 Mt in 2004. Coal is conveyed to the surface in a drift, with additional coal transport capacity, and there is potential for expansion of production capacity up to 4 Mtpa. A mine of this size would be more appropriate as it would have a life of around 30 years, more consistent with the aim of efficient reserves exploitation. To gain approval under current rules, however, it would need to explore the deeper seams and raise its projected life to more than 70 years. The Shuangliu case study underlines the urgent need to revise the mine design rules and approval procedures.

A.4.95 The predecessor of Shuangliu mine was a TVCM started in 1996 by Baijiayan Village that never reached the production stage due to bankruptcy. In 1998, Liuwan mine of Fenxi Mining Group and Baijiayan mine merged with the strong support of the Liulin county government. The sum of 3.6 million Yuan was paid for the incomplete, new small mine. Fenxi Mining Group obtained the approval of the SDPC to develop the Liliu mining area and

extend the small mine to a 1.5-Mtpa mine. Trial production of 250,000 t was successfully achieved following start of production on June 29, 2001. Responsibility for the management of the mine was separated from Liuwan mine in May 2002 when Shuangliu became a subsidiary of the Fenxi Mining Group.

A.4.96 The industrial foundation of Liulin County is stronger than that of Heshun County so the attention paid by Liulin county government to Shuangliu coal mine is substantially less than that paid by Heshun County to Tianchi coal mine.

A.4.97 Fenxi Mining Group has replicated its approach at the Hexi mine, which also has a production capacity of 1.5 Mtpa. The two Fenxi Group mines are the largest in the county.

Coal Sector Administration Procedures

A.4.98 Construction and operational approval procedures involved the provincial coal industry bureau and the provincial SDPC. As the design capacity exceeded 0.6 Mt, approval of the former SDPC at the state level was also required and obtained. The steps followed in this process have been described elsewhere (MRI 2003). The increase in lease area was granted on formal application to the land and resources department and obtained without difficulty. The mining rights were allocated administratively at no cost. This process does not allow competition and is inappropriate in a market system. The MRI report (2003) recommended the introduction of a bidding system for coal exploration and mining rights. MOLAR has successfully implemented competitive bidding for mining rights to some metals and is now devising procedures to include coal in this process.

Management and Personnel

A.4.99 The mine has a registered staff of 1,762 consisting of 653 production workers, 722 underground support personnel, and 387 management and service staff on the surface. The employees and management are generally young, the staff age range being 23–45 years. Each staff member has a spread of responsibilities and functions and has been selected on the basis of his/her knowledge and ability. There are detailed training programs to improve management and technological ability. Workers who transfer jobs and new starters receive safety and skills training. Relevant officials also receive training and refresher training in gas testing, dust protection, ventilation, fire, water and dust prevention, gas management, and monitoring and control systems.

A.4.100 **Salary and Incentive Scheme.** Senior management staff receive a salary of 50,000 Yuan per year consisting of a monthly payment and an annual bonus. Workers are paid at piece-work rates, for example, 180–210 Yuan/meter for rock drivages, 60–70 Yuan/meter for coal headings, 2.3–3.6 Yuan/ton on a mechanized face, and 6–7 Yuan/ton for conventional mining. The underground support workers receive a composite wage consisting of a basic wage and a component based on the assessment of the task finished and output. Rising coal prices have been reflected in income increases to the miners. Piece-work payments for underground drivages are common in other countries especially where contractors are used. However, there is the concern that eagerness to make rapid advance can

lead to safety omissions, especially with respect to setting roof support before advancing. Robust underground management systems are essential.

Coal Mining and Coal Preparation

A.4.101 The mining area of Shuangliu is 31 square kilometers and the workable seams are Nos. 3, 4, 8, 9, and 10. The license area of the former small mine was only 1.33 square kilometers. Approval has so far only been requested for working No. 3 and 4 seams). The other seams will be developed at a later date, approval being a formality. No exploration was undertaken as the area had already been drilled and Fenxi merely bought the results. It is common in China for the government to fund exploration, but in a commercial market such costs should be borne by the industry. No seismic investigation was conducted.

A.4.102 The mine is accessed by two shafts, one 4 meters in diameter, the other 3.6 meters in diameter and 217 meters deep. Coal leaves the mine via a drift. There is one fully mechanized working face of height from 2.6–3.5 meters. No. 3 and 4 seams are mined together as they are only separated by a thin dirt band. The first longwall face was 150 meters long, and subsequent faces are 180 meters in length.

A.4.103 Both the longwall and development drivages are fully mechanized, the latter using roadheaders. The equipment is manufactured in China. The integrated hydraulic support ensures safer and healthier conditions on the working face than with the individual hydraulic props used on conventional drill and blast longwall faces and timber supports used in most TVCMs. Modern roadway support systems reduce the risks of falls of roof. High-capacity ventilation systems improve gas control. Dual power supplies reduce the risk of ventilation stoppages and hence the risk of hazardous gas accumulations. Industrial television monitoring in the surface control room reduces the number of men needed underground and provides up-to-date management information to ensure the efficiency and safety of operations. Remote safety monitoring systems also enable underground environmental problems to be identified rapidly and major problems forestalled. Fire retardant conveyor belting reduces fire risks. Few if any of these technological safety advantages are present in small mines.

A.4.104 Shuangliu is classified as a gassy mine but the initial predictions made by China Coal Research Institute of a relative gas emission of 18 cubic meter/ton (moderately gassy) and an absolute emission of 60 cubic meters/minute have not been borne out in practice. Currently, the relative gas emission is 2 to 4 cubic meters/ton (relatively low gas) and the absolute emission is about 10 cubic meters/minute. If the gas emissions were as predicted, the mine could not have achieved its target coal production without use of methane drainage. The present emissions could be controlled safely by dilution with ventilation air. Nevertheless, a gas drainage system using an underground mobile extraction pump is in use, and a permanent system is being installed. Gas is drained from the worked seam using in-seam boreholes to reduce its gas content prior to mining. A gas mixture flow of 20–30 cubic meters/minute is reported, but because of poor borehole sealing gas concentrations are often low, varying from 5 percent to 50 percent. Gas drainage is not a critical safety or production issue at present as gas emissions are low. When workings progress deeper, more attention

will be given to gas drainage to ensure safe working conditions are maintained. The experience being gained at present will enable a more effective system to be established. However, the opportunity to capture and use some gas to mitigate greenhouse gas emissions is being lost.

A.4.105 Shuangliu mine was designed, and is operated, within the constraints of current design rules, guidance, and practice. While it attains an above-average safety and production performance, further improvements could be made. These include greater attention to frictional ignition prevention on coal-cutting machines and enhancing district and face-end ventilation systems to achieve optimum gas control. All gassy mechanized mines in China would benefit from attention to the above.

A.4.106 Gas emission prediction is important for ventilation, gas drainage, and safety planning. The large discrepancy between the expected gas emission and the actual values measured at Shuangliu should be investigated. Improved forecasting and knowledge of gas emission phenomena will help to further the design of safer coal mines.

A.4.107 **Coal Quality and Coal Preparation.** Clean coking coal with appropriate properties and slagging characteristics is essential for economic steel making. Efficient coal washing is therefore critical. A closed circuit coal preparation plant has been constructed to reduce the ash content of the Shuangliu coal from 20–25 percent to about 11 percent and also to ensure scarce water resources are protected. Thus, it is demonstrated that coal washing can be undertaken in a dry climate. In addition to meeting coal-use specifications, an additional benefit of reducing ash content by 9 percent to 14 percent is reduced transport costs for the premium coal—offsetting some of the coal preparation costs. The coal preparation plant with dense-medium cyclones produces high-grade coal, middlings, and waste. Sulphur is less than 0.5 percent but increases a little after washing (as the sulphur is concentrated in the coal not in the mineral matter). The plant can accept 1.5 Mtpa and produce 0.7–0.8 Mtpa of washed coal. The middlings would normally be sold to a power plant and the waste discarded. There is a suggestion that discarded, low-quality fine coal is used by the local villagers for heating and cooking. This use is undesirable and should be prohibited as it will lead to further deterioration of air quality and a worsening of public health. Coal preparation techniques are available that can optimize the quality of all the grades produced. In the absence of price incentives for coal quality or penalties for use of low-quality coal, there is no motivation for coal producers to act. The environmental regulatory framework should be expanded to deal with this issue and the regulations enforced.

Health and Safety

Safety Management Systems

A.4.108 The safety management level of small-scale, village-owned coal mines in the area is low. In 1997, a gas explosion killed 42 persons in a TVCM in Liulin County. In 2002, a gas combustion accident occurred in Shidongmen TVCM near Shuangliu mine.

A.4.109 In contrast, Fenxi Mining Group, which governs Shuangliu coal mine, has implemented stringent safety management measures. In the past three years, no fatal accident

has occurred in the Mining Group. From 2002 to the present, no fatal or serious injury has been recorded at Shuangliu coal mine. Shuangliu coal mine has implemented many kinds of safety management systems, including work safety system of job responsibility, accident investigation system, system of grading leaders by various rank in public according to their safety achievements, safety evaluation system, and “ventilation and disaster-prevention” management system. Each Friday is a safety day for employees. The manager holds a special safety work meeting every month to settle any safety problems identified on-site. A large-scale safety education activity is held every three months. Moreover, a safety assistant management committee composed of the Party, administration, labor union and League member, public security, and families committee has been established to oversee the safety of the mine.

Safety Incentives and Punishment Systems

A.4.110 Safety management systems at Shuangliu mine, as with all large mines in China, rely heavily on “carrot-and-stick” methods to ensure their effectiveness. While these methods can be applied in large mines as described below, small mine operators do not have the necessary management skills to implement them.

A.4.111 Safety risk mortgage transaction measures are instituted and carried out. District chiefs and managers must hand a fixed sum to their management departments. On reaching the safety target, he would receive a bonus equivalent to his deposit. If unsuccessful, he would be punished with a fixed portion of his mortgage on the basis of the severity of the accident (death, serious injury, or slight injury). The risk mortgage transaction measures of Shuangliu coal mine are similar to those of Tianchi coal mine.

A.4.112 District chiefs and managers are examined on their work safety achievements. They are rewarded or punished according to the status of safety management, removing and examining hidden troubles, compliance with rules and regulations, and engineering quality.

A.4.113 The safety status of the teams led by district deputies, team bosses, and leading hands and workers are evaluated by mine safety supervisors. The safety status is divided into four ranks: A, B, C, and D. Every team’s safety status must be reported each day. If a team is evaluated as rank A, 85 percent of the members of the team (17 of 20) would each receive 50 Yuan in accordance with the safety rankings within the team. While rewarding whole team effort is effective, the internal ranking is divisive and could detract from team spirit. If some “hidden troubles” of safety happened for three days continuously, the team bosses would each be fined 100 Yuan. If a fatality occurred in the mine, all the employees would have their wages reduced by 15 percent. Higher ranks receive stronger penalties.

A.4.114 The county magistrate and deputy magistrate with responsibilities for the industry, the director and deputy director of safety, and the deputy director responsible for the accident site in the mine will lose their jobs if three or more fatalities occur. There are signs that these penalties are being exacted, which is raising the level of accountability for safety to include key decisionmakers, an important step forward. By applying this stricture to all mines, the authorities are placed under increasing pressure to address the safety problems

in small mines. Shortage of inspection and enforcement staff has yet to be resolved but this measure may help to ensure the closure of illegal mines.

Safety Training

A.4.115 Mine managers receive training at the government-sponsored provincial coal mine safety training center. Specific officials and district chiefs are trained in the safety center of Fenxi Mining Group. The mine has a formal safety education and training system with full-time staff. Worker training is organized at the mine. All employees are required to attend a one-week course each year. New workers receive one-week of training before they commence work, as do workers whose jobs are changed. All persons must pass an examination before they are permitted to work, and their score is reflected in their wages as an incentive to study.

Environment

A.4.116 Shuangliu coal mine is located in the northwestern part of Liulin County in the Hedong coalfield. The mine site lies to the east of Baijiayan Village, Mengmen Town, Liulin County, 17 kilometers from the county town of Liulin and No. 307 national road. The railway from Xiaoyi to Liulin crosses the southern part of the coalfield, and its terminal station (Mucun Station) is 21 kilometers from the mine site. The topography is hilly to mountainous with deeply incised valleys and is characteristic of typical loess plateau with major erosion features, scarce vegetation, and serious soil erosion. Ground elevations range from 644 to 998 meters. The rivers in the coalfield area only flow intermittently to discharge into the Yellow River. The haul road to the mine follows a riverbed at the base of a major steep-sided valley with steep loess slopes that have been stabilized in places.

Identification and Evaluation of Principal Environmental Impacts

A.4.117 An environmental appraisal and an environmental management plan were prepared following similar procedures to those described for Tianchi mine. At Shuangliu the main environmental sensitivities were deemed to be underground water, air quality, and surface water with ecological environment, visual impact, and public health as secondary issues (table A4.4).

A.4.118 Analysis of the environmental factors indicates that topography and landforms, vegetation, landscape, and air and surface water quality in the locality are the most sensitive issues, while groundwater, noise, and visual impact are secondary. It is interesting to note that the subsidence effects of mining are considered a relevant visual impact by the environmental assessors. While the landform will change, the magnitudes will be insignificant relative to the natural relief in this mountainous area.

A.4.119 Human activity outside the mine has caused pollution. Surface water in two of the nearby monitoring points is polluted by volatile organic compounds, and groundwater sampled in boreholes shows excess bacterial levels. The mine itself has a minewater treatment process and a sewage treatment plant to prevent escape of any additional pollutants. The mine will therefore not exacerbate the pollution. A small mine would not have had such controls.

A.4.120 Air pollution sources on the mine site include boilers and stoves that are all fitted with de-dusting equipment. The mine lies in the base of a steep valley protected from strong wind thus limiting dust pickup from coal stockpiles. Solid waste is used as fill, compacted, covered with 1 meter of loess, and planted. Refuse is deeply buried. Given the dry climate leachate formation is minimal and is rendered harmless by dilution and dispersal.

Table A4.4. Main Environmental Factors in Shuangliu Coal Mine Extension

	<i>Air</i>	<i>Surface Water</i>	<i>Underground Water</i>	<i>Noise</i>	<i>Ecology</i>	<i>Landscape</i>	<i>Public Health</i>
Underground mining			?		?	?	
System of hoisting and ventilation							
Waste water and sewage		?	?				
Boiler room and shaft heater	?			?	?		?
Coal waste and slag	?	?		?	?		
Truck transportation	?				?		
Key	? significant influence; ? medium influence; ? slight influence						

Source: China University of Mining and Technology

A.4.121 The main impacts of the mine are surface subsidence caused by longwall mining and dust caused by coal transport. Sensitive areas, such as villages, are protected by pillars but elsewhere there is the possibility of landslips occurring where steep loess slopes are undermined, especially during heavy rainfall. Engineering measures will be taken where necessary but as the area is scarcely populated and minimal impact on surface drainage is expected, subsidence damage is not considered a major issue. These considerations are similar to those applied in developed countries that practice extensive longwall mining. However, stringent monitoring and enforcement reinforced by vociferous public response to any misdemeanor ensures compliance in those countries.

A.4.122 A dirt road leads from the mine to the highway. The road is deeply rutted in places because of heavy use and requires regular repair. Private cars use the road but some parts are barely passable. The highway, on leaving the haul road, is dusty as a result of soils deposited by the heavy trucks. A wheel-wash at the exit to the haul road would reduce this pollution considerably. Trucks carrying coal should also be covered to prevent dust.

A.4.123 Shuangliu is a gassy mine, and a proportion of the methane is drained from the worked seam for reasons of safety. The concentration of gas recovered is highly variable. Improvements could be made underground to ensure a steadier supply of high-purity gas that

could be piped to the surface and used in boilers thus reducing greenhouse gas emissions from the mine. One use could be for heating the ventilation intake air in winter to replace or supplement the present coal-fired system.

Environmental Management and Enforcement

A.4.124 A management plan was established during coal mine design and construction to ensure proper consideration of environmental issues. The environmental management plan for the mine subsequently developed sets the monitoring and response criteria for normal operations. Implementation of the plan at the mine is the part-time responsibility of a single person. This would seem an inadequate manpower resource and should be strengthened. On the positive side, since no attention is paid to environmental issues at small mines, the exercise for large mines, although far from perfect, is a step in the right direction. The Shanxi Environmental Protection Agency, supported by Luliang EPB, is responsible for checking emissions and discharges at Shuangliu mine and also for charging pollution fees. Because of lack of staff resources checks are not made at the mine and presumably no pollution fees are paid. Without independent checking, adherence to environmental legislation will be patchy. Stronger enforcement by the EPB is needed to ensure adherence to environmental regulations.

Economic and Social Aspects

A.4.125 The total capital for the Shuangliu project was 450 million Yuan of which 120 million Yuan came from a provincial government-approved bank loan at 5.6 percent annual interest and the remainder from Fenxi Group. Government guaranteed bank loans will no longer be widely available as China's banking system is reformed to meet WTO requirements. Loans will be determined purely on commercial risk. Mining companies with poor credit ratings or with high-risk projects will be unable to raise loans. The coal mining sector will need to attract substantial private sector financing to complete its restructuring.

A.4.126 The incremental investment cost per metric ton of Shuangliu mine was 278 Yuan/ton (for an increase of capacity from 0.03 Mtpa to 1.5 Mtpa) compared with that for Tianchi mine, which was estimated at 192 Yuan/ton (0.06 Mtpa to 1.2 Mtpa). The main reason for the difference is the higher cost of surface infrastructure at Shuangliu; the coal preparation plant cost may possibly be included in the Shuangliu figure although this is not clear. These are reasonable and competitive costs that would increase if imported foreign equipment was used. Higher equipment costs could be justified by productivity gains.

Coal Sales

A.4.127 Shuangliu mine sells coal to Fenxi Group at an internal price. The internal prices set by the group are 80 Yuan/ton for raw coal (essentially, cost price), 235 Yuan/ton for washed coal, and 35 Yuan/t for middlings. The mine's production costs are 81 Yuan/ton for raw coal and 123 Yuan/ton for washed coal. The current true prices (October 2003) in the local coal market are 250 Yuan/ton for raw coal and 450 Yuan/ton for washed coal. From January to September 2003, the combined output of salable coal was 0.47 Mt (0.02 Mt middlings and 0.45 Mt washed coal), generating a sales revenue of 106 million Yuan (at

internal prices) for the mine. Fenxi Group gains the benefit of the large difference between the internal price and the market price of 215 Yuan/ton.

A.4.128 Coal is transported 25 km by road to a rail terminal. If the coal production capacity of the mine was to be raised further then consideration should be given to constructing a rail spur to the mine site. This would remove the heavy truck traffic and significantly reduce noise, dust, and road hazards.

Positive Impacts of Coal Mining Activities on the Local Community

A.4.129 The benefits of the mine to the local economy are average incomes to workers amounting to 13 million Yuan per year flowing into the nearby village. Additional benefits include an estimated 16 million Yuan of salaries and wages entering nearby townships, 1,400 new jobs (excluding those in the original mine and those created in the secondary economy), and the establishment of a road haulage company to carry coal to the railway. The mine also provides additional income to the railway and its loading terminal. Local communications have been improved due to the extension of the Liumeng highway, which involved the construction of two new bridges and two tunnels. The effect of the mine development has been to stimulate development of local service industries for the mine and for the workers with higher disposable incomes, some 10-fold higher than average local wages. Before the mine was developed there was apparently a social problem in the village due to an excess of bachelors. With the coming of the mine and the increasing wealth of the local economy the eligibility of bachelors in the village greatly increased, and the balance has been restored. The economic attractions of the area could lead to uncontrolled expansion and needs to be controlled properly.

A.4.130 Although the reforming of Shuangliu colliery has benefited the economic and social development of Liulin County, a portion of the fiscal income is transferred to Jiexiu City where the Fenxi Group is registered. The method of internal sales within Fenxi Mining Group means that the true sales price is not allocated to individual mines. For example, the internal price for washed coal is 235 Yuan/ton but the current market price is 450 Yuan/ton. Local sales and income tax to Liulin County of 29 million Yuan per year is therefore lost (estimated from the price difference of 215 Yuan/ton, 0.6 Mt extrapolated output of washed coal for the full year 2003 and taxes calculated pro rata from table A4.5). However, this still leaves a substantial 31 million Yuan/year in Liulin compared with the 0.6 million Yuan/year that the original small mine would have yielded. These taxes are used for construction, infrastructure projects, and education.

Table A4.5. The Generalized Economic Performance of Shuangliu Mine

	<i>Before Reconstruction</i>	<i>After Reconstruction</i>
Output of raw coal (megaton)	0.03	1.50
Average price of coal (Yuan/ton)	-	130
Annual income from sales (million Yuan)	-	195
Annual sales tax and surtax (million Yuan)	-	21.2
Annual total profit (million Yuan)	-	66.8
Income tax at 33% (million Yuan)	-	22.1
Incremental return on investment after tax (%)	0	16.8

Source: China University of Mining and Technology

Social and Welfare Benefits

A.4.131 In contrast to workers in the small mines, miners at Shuangliu benefit from less physically demanding, safer, and healthier working conditions, secure employment, better training, and job development opportunities. The mining enterprise pays pension contributions to full-time workers at 17 percent of a worker's monthly earnings (excepting the part that he pays himself). This payment is specified by the National Ministry of Labor and Social Security and its provincial equivalent. In addition, according to regulation, the enterprise should pay for medical treatment, injury insurance, and unemployment insurance. These three kinds of insurance account for 49 percent of the payments to workers. Workers in small mines would not receive this level of welfare support.

A.4.132 There are few, if any, opportunities for injured or chronically ill miners to be transferred to surface operations at small mines due to the large number employed underground compared with the relatively few on the surface. A strong welfare culture in large mines such as Shuangliu affords this option.

Mine Closures

A.4.133 Liulin county government closed 13 small mines each with an annual coal production of less than 60,000 t in 2002. This implies closure of a combined capacity of less than 0.78 Mtpa. The county government plans to reduce the number of mines from 73 to fewer than 40 by the year 2007. The minimum production capacity will then be 300,000 tpa. Assuming an average capacity of 180,000 tpa among the closed mines, these additional closures represent the loss of a further 6 Mtpa. Three or four mines similar to Shuangliu could replace this production capacity, taking into account the expansion potential of Shuangliu. Polarization of economic benefit and redundant workers from the small mines remain problems for which no policies have been developed.

A.4.134 Mine closure in Liulin is decided by administrative order, closing the smallest and least efficient first. As in Heshun, the role of safety inspections in identifying small

mines for closure is unclear. Coal production and hence revenue concerns are influencing the county's decisionmaking process but great efforts are being made to improve safety in the small mines, with some success. This indicates that enforcement of regulations forcing local authorities to accept some responsibility for mine accidents is beginning to have some effect.

Annex 5

Workshops

Proceedings Coal Sector Administration & Investment Workshop. Beijing, August 26, 2003

Workshop sponsored by the National Development and Reform Commission and the World Bank

A.5.1 A workshop was held on August 26 in the Kunlun Hotel, Beijing. The purpose was to discuss the report “Review of the Institutional and Regulatory Framework Governing the Licensing and Operation of Coal Sector Enterprises in China,” prepared by Mitsubishi Research Institute (MRI), and to seek agreement on follow-on actions.

A.5.2 The participants in the workshop included representatives from key central and local government agencies involved in coal sector administration, selected local mining companies, local offices of international coal mining companies, research institutes, and the China University of Mining and Technology. The workshop agenda and a list of participating organizations are attached.

Welcome and Opening Comments

A.5.3 **Mr. Wu Yin, Deputy Director, Energy Bureau, National Development and Reform Commission (NDRC)**, opened the workshop with a welcome message of NDRC and then reviewed the current status of the coal sector and progress with its reform. Since 1996, China has become the largest coal producing and consuming country in the world. Coal accounts for about 60 percent of the consumption of primary energy in China. In the first half of 2003, the run-of-mine coal production and coal sales increased by 19 percent over the previous year, coal prices increased slightly, and the operational performances of coal enterprises improved.

A.5.4 In 1998, 94 major state-owned coal mines were handed over to the local authorities. The role of government changed to macro management, social matters, and public service, while production and operational responsibility rested with the coal mining enterprises. Recent organizational reforms approved in the Tenth National

People's Congress of 2003 included the establishment of a State-Owned Assets Supervision and Administration Commission of the State Council (SASAC), a Ministry of Commerce, and reorganization of the State Development and Planning Commission (SDPC) into the NDRC. The National Safety Production Supervision Bureau, which was originally controlled by the State Economic and Trade Commission, now reports directly to the State Council. The purpose of these reforms is to further reduce government intervention in the economy consistent with WTO requirements and a further move toward a market economy. The new NDRC has set up an Energy Bureau the aims of which are to study energy exploitation and utilization internally and externally; propose strategies and policy for energy development; plan energy development; make recommendations for reform; administer the petroleum, natural gas, coal, and electricity sectors; manage national petroleum reserves; and propose policy and measures for energy saving and development of new energy resources. International coal mining is dominated by relatively few, but strong, companies that are constantly seeking to access new coal resources and expand their market share. Some U.S. and Australian coal mining enterprises are actively investigating China's coal mining sector, and there is a need to determine how best to deal with this interest to the benefit of all parties.

A.5.5 The Department of Basic Industry of the former SDPC engaged the local research institute to assist in the World Bank–supported study of the coal sector's regulatory and institutional framework. The study report is a valuable source of reference to help foreign investors understand the coal mining investment environment in China and for local coal mining enterprises and government to understand the needs of foreign investors. The Energy Bureau of the NDRC and the World Bank cosponsored this workshop in order to further develop the study report and to establish a platform for exchange and communications between Chinese and foreign officials and experts.

A.5.6 **Mr. Peter van der Veen, Manager, Mining Department, World Bank,** introduced the role of the World Bank and its role in coal sector reform in developing countries with specific reference to China. Mr. van der Veen stressed the importance of sustainability to improve the economic, environmental, and social impact of mining, and also the importance of the World Bank as a source of knowledge. He went on to outline the World Bank's involvement in the mining sectors in other countries and the shift in focus from technical assistance projects to institutional strengthening that deals with social issues, environmental improvements, and energy conservation. ESMAP is an energy system management program that is administered by the Bank and dedicated to help developing countries to secure efficient energy in an environmentally and socially responsible way. The Coal Sector study made by the Mitsubishi Research Institute of Japan to be discussed at this workshop is an important part of ESMAP's activity in China. Today's workshop is hopefully the beginning of a dialogue that will help China to secure an economically efficient sector that has capacity to produce coal in an environmental and socially responsible way.

A.5.7 **Mr. Jin Yuzhong, Chief, Planning and Management Department, Ministry of Land and Resources (MOLAR)**, traced the development of the administration of exploration and mining rights in China. The principle of granting mining right in exchange for a fair valuation of the mineral was established in 1996, and procedures have been gradually introduced across the country. MOLAR has a role to improve the administration of exploration and mining rights in line with government policy to introduce market competition and encourage private investment. It is also helping to address the problems of backward, inefficient, small-scale coal mining by more stringent reviewing of applications for exploration and mining rights. Existing laws and regulations are currently being examined and revised. A platform is being established that should encourage foreign investment and be consistent with the needs of a market economy.

Presentations

Assessment of the Existing Institutional and Regulatory Framework

A.5.8 **Dr. David Creedy, Wardell Armstrong**, described the existing coal mine sector administration framework highlighting recent reforms and also key problem areas that merit attention if international practices and standards are to be ultimately achieved.

A.5.9 There are four levels of coal mining administration—state, provincial, prefecture, and county. State-owned coal mining enterprises are administered by provincial government. Review and approval procedures for projects and licensing are generally referred vertically within the administrative structure while review and liaison occurs laterally across coal mining, safety, and environmental protection departments. Coal access rights are becoming more open to competition although there is too much coal tied into existing mining enterprises some of which do not have the financial and technical resources to develop them. Mining approval procedures are time consuming and unnecessarily complex. Some of the criteria for acceptance are based on outdated, inflexible design rules. A number of giants are emerging among the mining companies, and these are now looking to other provinces to extend their reserve bases and to invest also in downstream power and chemical projects. Railway capacity is limited, short-term coal sales contracts prevail, and export rights are limited to four approved companies.

A.5.10 There is poor enforcement of regulations, and illegal mining is an issue. The coal mining sector has insufficient funds to meet its environmental reclamation commitments. Land and resources departments have a role in administering land after mine closure but not the funds. Environmental penalties are inadequate and enforcement weak, especially of township and village mines (TVCMs). Despite major reforms to strengthen safety legislation and its enforcement, there has been no significant reduction in coal mining fatalities over the last 10 years. There is a fundamental safety culture problem and a blatant disregard for safety regulations. The safety record of TVCMs is very poor. While SOCMs are generally safer, their standards are still below the international norm. Outdated mining electrical equipment standards and a protracted approvals process is hindering the import of safe, modern equipment. The state continues

to provide social and financial assistance to SOCMs. Foreign direct investment remains limited to one mine.

A.5.11 Reforms are being implemented, and government intervention is being reduced as its role changes from control to monitoring, regulation, and enforcement. Current coal sector reforms include administrative streamlining, continued strengthening of safety laws and enforcement, minimum capacities for new mines, revision of design standards, and closing/merging of small local mines as well as bankrupting/closing uneconomic state-owned mines.

Experience of the Existing Institutional Framework Based on a Review of Current Practice in Shanxi and Shandong Provinces[[b]]

A.5.12 **He Youguo, China Coal Industry Development Research and Consulting Center**, reported on the situation of coal mining in Shanxi and Shandong Provinces. Shanxi claims recoverable reserves of about 150 billion tons (2001) and it has 5,500 coal mines producing 363 Mt of coal in 2002, of which 280 Mt was transported outside the province. The coal development plan for the province envisages 300–350 Mtpa by 2005 and 380–400 Mtpa by 2010 and the closure of about 27 KSOCMs by 2005. In contrast, Shandong has recoverable coal reserves of 8 billion tons (2001), producing 109 Mt in 2001. The construction of TVCMs has not been permitted since 2000. Twenty-five SOCMs are to be closed.

A.5.13 Staffing levels in the various coal mining administrative departments were provided, based on case studies made at provincial, city, and county level. The duties of the various departments were outlined. Due to the large number of mines, especially TVCMs in Shanxi, the province faces serious safety problems arising from poor basic conditions, malpractice and weak law enforcement, inadequate mine gas control, poor safety management, and poor equipment. The situation in Shandong is better due to fewer small mines and a workable mine safety supervision system. Environmental problems in Shanxi are mainly caused by the small mines. Only 20 percent of mined land is reclaimed. In Shandong only 9 percent of mined land has been reclaimed. Existing reclamation fees are insufficient. In rationalizing the coal sector, Shanxi has closed some 6,000 small coal mines in the last 5 years. In comparison Shandong has closed all 542 of its illegal and irrationally distributed coal mines.

A.5.14 A case study was made of Yankuang Group as an example of domestic investment in coal mining. The company is expanding outside its home province and investing in mining projects in Guizhou, Shanxi, and Inner Mongolia. It is also seeking overseas mining investment opportunities. Yankuang Group is a model example of what government of China policy is seeking to achieve in terms of replacing small mine capacity with large, modern mechanized mines as well as stimulating domestic investment in new mine capacity.

International Comparisons

A.5.15 **Hu Yuhong, China Coal Information Institute**, described the resource administration process in the United States and Australia with emphasis on the

competitive bidding system used in the United States and the royalty payments per ton levied in Australia. These provide model examples for China, which introduced a bidding system for some minerals in 1998 but which has not yet been fully developed in the coal sector. Approval processes for mine exploration and development in the United States are protracted (up to 10 years), but they are streamlined in Australia, taking only a few months. Exploration licenses are valid for up to 5 years and mining leases for 21 years.

A.5.16 The Mine Safety and Health Administration in the United States is 32 times more effective than the equivalent organization (the State Administration of Coal Mine Safety) in China in terms of preventing mining fatalities. The United States and Australia have various schemes for ensuring that mines give due consideration to environmental protection. Mines in Australia are required to prepare and operate environmental management plans. Security deposits are also lodged with the authorities (New South Wales) to ensure reclamation is properly undertaken. The United States has established an abandoned mine reclamation fund.

A.5.17 China is facing economic and social problems in areas affected by mine closures. Other countries have undertaken major rationalization of the coal sector, in particular the United Kingdom and Japan. Some 915 coal mines were closed and more than 202,000 mine workers made redundant in Japan. Mines were identified for closure on the basis of their safety and economic viability. In both the United Kingdom and Japan policies were successfully implemented to encourage coalfield area regeneration. Japan afforded the same social and financial support to all mines irrespective of their size. In China, most of the support goes to the SOCMs as a high proportion of the small mines are disqualified as illegal.

Conclusions and Recommendations

A.5.18 **Li Shi, Mitsubishi Research Institute (MRI), summarized the results of the study carried out by MRI.** Coal mining sector administration and management in China is still stifled by command-economy thinking. The principles of market economy do not appear to be well understood and are not being applied. A market economy requires level opportunity for all. Without stronger enforcement of laws and regulations this condition will not be achieved. The current weaknesses in coal sector administration can be summarized under the acronym MILES: Market Interference, Illegal Mining, Leasing of Coal and Data Availability, Environment, and Safety.

A.5.19 **Market Interference.** Government intervention, regulation of coal supply, transport allocations, limited approved export agents, preferred treatment of KSOCMs and overly restrictive mine design and equipment regulations are preventing market forces from improving the efficiency of the coal mining sector. As a result, private investment is being discouraged, long-term energy supply is not assured, and there are too many opportunities for corruption. It is recommended that changes are made to allow the development of a competitive market where supply, demand, and prices are all determined by the market, price collusion between companies is eliminated, export

controls are removed, all coal companies are treated equally, and international-standard mine design and equipment regulations are introduced.

A.5.20 **Illegal Mining.** Illegal mining has destroyed a substantial share of China's best coal reserves, created thousands of underground hazards for future miners, and has caused some serious accidents when encountered by legal mines. The availability of cheap, illegally mined coal undermines the market. To combat this problem there is a need for wholly independent inspection and enforcement departments, ongoing field monitoring, a retraining program for unemployed miners to discourage them from reopening closed illegal mines. Small business loans should be provided to stimulate alternative businesses and employment when mines are closed. In addition, minimum size limitations for a legal mine should be removed. The size of mine should be determined by market forces, subject to its compliance with all relevant operational, safety, and environmental legislation.

A.5.21 **Leasing of Coal and Data Availability.** Long-term land leases are tying up large coal resources with mining enterprises some of which do not have the financial resources to develop them. The lack of a central repository for geological and lease information hinders the selection and evaluation of potential sites for investment. It is recommended to introduce an annual "holding fee or royalty" to discourage mining enterprises from holding coal areas with no plans for development. Mining license periods should be no more than 25 years, and there should be competitive bidding for licenses. A review of geological data, coal exploration, and mining rights deficiencies should also be undertaken, and measures should be taken to encourage foreign investment in exploration.

A.5.22 **Environment.** Environmental studies are undertaken at the feasibility stage to get a mining license but provisions for reclamation after mining are inadequate. Environmental protection departments can be influenced by local authorities with vested interests in mining. There is a need for independent inspection and enforcement departments. Mines should be required to pay a reclamation bond. All funds collected for environmental purposes should be used exclusively for that purpose, and there should be periodic audits.

A.5.23 **Safety.** Coal mining in China has an unacceptable safety record. All mines need to improve, but the small mines and especially the illegal mines are the most hazardous. The high accident rates arise due to insufficient training, lack of modern mining equipment and practices, and the weak power of mine inspectors. Wholly independent safety inspection and enforcement departments are needed. Inspectors should be given more authority, and confidential reporting by miners should be introduced as a short-term measure, pending development of an effective safety culture and risk assessment approach comparable with that used in advanced coal mining countries.

Presentations by Mining Companies

A.5.24 **Mr Niu Kehong, Yankuang Group, Strategy Research Institute**, explained how Yankuang Group had attained international competitiveness and outlined its development strategy. Yankuang is the largest coal enterprise and coal export enterprise in East China and one of the largest coal enterprise groups of China. Its coal output of 2002 was 41 Mt, with 14 Mt exported. It is estimated that output in 2003 will be 43 Mt, with 16 Mt exported. Sales in 2002 amounted to 14.6 billion Yuan, 58 percent from the coal sector and 42 percent from electricity power, coal chemicals, building construction, and building materials. Its sales income is estimated to be 17 billion Yuan in 2003. Mr. Niu suggested some reform needs for the coal mining sector, some involving state support such as clean coal technology developments and promotion of more exploration. Particular emphasis was put on a call for a review of taxes and charges on coal enterprises and coal products. Export controls should also be relaxed.

A.5.25 **Mr. Du Donghai, Rio Tinto Beijing Office**, presented an overview of the Australian coal industry as a yardstick against which future developments in China might be compared. Most of Australia's coal production (266 Mt in 2001) comes from New South Wales (113 Mt) and Queensland (143 Mt). Seventy-two percent of the salable production comes from five main coal producers of which BHP Billiton is the largest and Rio Tinto the second largest.

Discussion by The Coal Industry

A.5.26 Q1: The coal industry in China needs capital for development and foreign capital is one of the potential major sources. So far, only a small amount of foreign capital has been attracted to the coal mining sector in China. What is the main reason?

A.5.27 A: TVCMs produce about 40 percent of total coal output, and a market mechanism needs to be introduced to strengthen the international competitiveness of industry. There is no environment for SOCMs to grow. Leasing of the resource is important to determine the mining rights. A system of auction has been introduced but the pricing is not fair. Vast coal resources are available for development in the western provinces of China but distant from the main consumers in the east. There is an urgent need of transportation reform (railway), especially in the western part of China, since there is still a monopoly. Too complex procedures of investment review and approval, incomplete related laws and regulations, and the incomplete reform of the electricity market are also relevant factors (Prof. Wang Lijie, China University of Mining and Technology).

A.5.28 Q2: Recently, the Ministry of Land and Resources has published two documents on the auction of mining right. Please tell us about the prequalification process before tender for auction.

A.5.29 A: Since 1998, the Chinese government has published three administrative laws and regulations complementing the Law on Mineral Resources: "Registration Management Method on Exploration Block of Mineral Resources," "Registration

Management Method on Mining of Mineral Resources,” and “Management Method on Transfer of Mineral Exploration and Mining Rights.” In June 2003, the government published “Listing Management Method on Tendering of Mineral Exploration and Mining Rights (for trial)” and this further provides the conditions for fair and open competition of various investors. The new legislation put forward the provision that foreign enterprises should firstly establish an enterprise in China if they intend to participate in tendering for mining right. It also requires that technology and financial situation meet designated standards and that there was cancellation of exploration and mining rights in the previous two years. A process of “first come, first served” is being considered by MOLAR for allocation of mining rights for new areas where no competitive bidding is envisaged due to the lack of data and high risk (Mr. Jin Yuzhong, MOLAR).

A.5.30 Q3: How does China review and approve foreign investment ?

A.5.31 A: Currently, China is reforming its review and approval procedure for construction investment, including investment in the coal industry. The general principle for the new system, which is about to be published, is to simplify the procedure, and the original review and approval system may be changed either to a “put on record” or to an “examine and approval” system. The current system will apply until the new system is published, that is, a construction investment for a project above 0.6 Mt should be submitted to NDRC for review and approval (the specific responsible agencies are Energy Bureau, Department of Foreign Affairs, and Department of Investment). The Provincial Planning Commission is responsible for reporting to the central government.

A.5.32 Q4: Currently, what quantity of economic coal resources is available in China?

A.5.33 A: According to the calculation standard ratified by the United Nations, the coal reserves of China are 114.5 billion [metric] tons, and this ranks at the forefront in the world. Previously, China adapted the calculation standard of coal reserves from the former Soviet Union. It started to adapt the United Nation’s standards from 1993, and this work was completed in 1999. These are overall estimates and not aggregates of calculated reserves for all mines as such a task is considered impracticable.

A.5.34 Q5: Does China have significant reserves in the true sense, that is, economically minable coal, given the losses incurred by the coal sector in the past and the large volumes of resource, not yet explored, within existing long-term mining leases?

A.5.35 A: China has large “basic reserves” that are not economically exploitable now (but may be in the future) and “reserves” that are economic and can be extracted now.

A.5.36 Q6: China has abundant coal resources, particularly in the western part of the country. Will China start large-scale development or not?

A.5.37 A: The development strategy of coal resources in China is to stabilize development in the eastern part of China, develop the central area, and gradually transfer

development to the western areas. West-to-east electricity transmission will enable power to be generated from coal in the west and sent to consumers in the east (NDRC).

A.5.38 Q7: In China, the areas where coal resources exist are distant from coal users. Coal haulage distance is long, and therefore will future policy consider the transportation cost? For example, does China intend to develop coalfields in Xinjiang Uygur Autonomous Region?

A.5.39 A: Xinjiang has abundant coal resources but these are reserved as a contingency. In the distant future large-scale mining would not be implemented unless there was an overriding strategic need (NDRC).

A Proposal for Two Case Studies

A.5.40 **Mr. Heinz Hendriks, World Bank**, outlined a proposal for two case studies to be undertaken as a follow-on project. The idea was to select two mines that illustrated specific features of good practice in respect of efficient exploitation of reserves, high health and safety standards, environmental protection, economic performance, and social responsibility. The project would be sponsored by ESMAP and administered by the World Bank's Mining Policy and Reform Division. The case studies would be seeking to improve the performance of coal mines across China. This would be done by describing the key procedures, approaches, and attitudes that made the case study mines good examples of sustainable practice; analyzing the potential impact on regional and national economic, social, and environmental development, as well as on the promotion of future responsible coal mining investment; and providing to policymakers in local, regional, and national government useful models (toolkits) for replication of superior health and safety, environmental performance, and social responsibility.

A.5.41 On completion of the case studies an international conference and workshop would be held with the Chinese government and other significant stakeholders in China's coal sector to discuss the case study findings and recommend how best to implement changes that would facilitate a safer, sustainable, and environmentally sound coal sector and create the right conditions for renewed investment and mobilization of private capital. The international conference would bring together government officials and policymakers, foreign investors, community representatives, worker representatives, and other interested parties. It is anticipated that the case studies will be completed by December 2003.

Workshop Summary and Concluding Comments

A.5.42 There was general agreement on the conclusions and recommendations of the report. The workshop participants supported the proposal for the two case studies. Under the auspices of ESMAP the case studies would build on the existing work and would involve studying two good examples of sustainable coal mining in China with the goal of contributing to the improvement of operational, safety, environmental, social, and economic performance of coal mines across the country. It was concluded that the MRI

report should be finalized, the two proposed ESMAP case studies implemented, and a conference be held toward the end of the year, building on both the MRI report and the case studies.

A.5.43 **Mr. Peter van der Veen** summarized the topics discussed after applauding the founding of the new energy bureau in the NDRC as a positive step forward consistent with the aims of the study. More of the barriers are being progressively dismantled in ongoing government reforms. However, there is some concern about MOLAR's proposal to implement a "first come, first served" policy for exploration rights of resources in new, unproved mining areas as it would create uncertainty. Also, the different meanings of coal resource and reserves as they are applied in China compared with elsewhere continue to cause confusion.

A.5.44 An efficient coal mining sector will evolve once a market system is allowed to operate but the government is reluctant to remove all the controls. However, a market system will not be effective until a level playing field is established. That means environmental and safety compliance by all to the same standards and successful elimination of illegal mining. At the same time, government must reduce its intervention and move away from planned-economy thinking by removing transport, export, and supply controls and ensure the fair allocation of coal resources by open competition. Independent agencies are needed to monitor and enforce safety and environmental laws and regulations. The difficulties of implementing the changes are recognized, and it is hoped that such forums as this will help. The experts' opinions will provide a starting point for next steps. To find the best way for solving the problems, cooperation will be needed between the relevant departments of the government, and opportunities can be taken to examine international experiences.

A.5.45 **Wu Yin, Deputy Director Energy Bureau, National Development and Reform Commission**, made the closing comments. The workshop held is very significant and a great help. Foreign countries want to know more about China's coal industry. China's coal industry is turning from a planned economy to a market economy and seeking a way of developing forward. The government's coal industry plan can be summarized as follows:

1. Develop a long-term development plan for the coal sector to exploit the coal resources of China in a safe, sustainable manner to meet future demand.
2. Improve the existing legal framework and set standards to enable the market to be monitored.
3. Allow coal enterprises to expand and grow and stop reckless competition from TVCMs.
4. Improve government regulation of small mines.
5. Encourage coal sector companies to ally with other industries to improve their economic performance.

6. Better utilize coal and associated resources and minimize environmental impacts.

7. Promote coal processing.

A.5.46 To speed up the course of the reform, the government will reduce its intervention, stop illegal mining, strengthen coal management and coal mine safety supervision, improve the investment environment, and attract more foreign investment in the development of China's coal industry.

Attachment 1: Workshop Program

Registration (8:00-9:00 a.m.)

9:00-9:40 a.m.

Opening

- Welcome/opening comments (Wu Yin, NDRC)
- World Bank's role and workshop objectives (Peter van der Veen, World Bank)
- The role of Ministry of Land and Resources (Jin Yuzhong, MOLAR)
- Introduction and roles of team members (Li Shi, MRI)

9:40-10:40 a.m.

Presentation of interim study results – Part 1

- Assessment of the existing institutional/regulatory framework (David Creedy)
- Field study results (He Youguo, R&C)

Coffee/Tea Break (10:40-11:00 a.m.)

11:00-11:40 a.m.

Presentation of interim study results – Part 2

- International comparison (Hu Yuhong, CCII)
- Conclusions and recommendations (Li Shi, MRI)

11:40-12:00 p.m.

Questions and Answers (facilitated by Li Shi and David Creedy)

Lunch (12:00-1:30 p.m.)

1:30-2:30 p.m.

The coal industry's view

- Rio Tinto and the Australian Coal Industry Overview (Du Donghai, Rio Tinto)
- To Construct an Enterprise Group of International Competitiveness & Continuing Development (Niu Kehong, Yankuang Group Co. Ltd.)

2:30-4:10 p.m.

Panel discussion (Representatives of Chinese mining companies and foreign investors)

Coffee/Tea Break (4:10-4:20 p.m.)

4:20-4:40 p.m.

A proposal for two case studies (Heinz Hendriks, World Bank)

4:40-5:00 p.m.

Closing comments (Peter van der Veen, World Bank, and Wu Yin, NDRC)

Dinner (5:30-7:30 p.m.)

Moderators: Wei Pengyuan, Energy Bureau, NDRC (morning) and Zhou Fengqi, Energy Institute, NDRC (afternoon)

Attachment 2: List of Participants

World Bank

Peter van der Veen, Manager
Charles Husband, Lead Mining Specialist
Heinz Hendriks, Senior Mining Specialist
Zhao Jianping, Senior Energy Specialist, World Bank Beijing Office

Consultants

Mitsubishi Research Institute

Li Shi, Senior Consultant
Hiroaki Nagayama, Senior Consultant
Akiko Sakakura, Researcher

Wardell Armstrong

David Creedy, Partner

Chinese Participants

Energy Bureau, National Development Reform Commission

Wu Yin, Deputy Director
Wei Pengyuan, Division Director
Li Haofeng, Division Deputy Director

State Administration of Work Safety

Cai Yanli, Director

Policy and Legislation Department

Zhu Yichang, Deputy Director

Energy Institute of National Development Reform Commission

Zhou Fengqi, Professor

Ministry of Land and Resources

International Cooperation and Science and Technology Department

Ma Yongzheng, Division Director

Planning and Management Department

Jin Yuzhong, Chief

Environmental Protection Agency

Qian Yong, Director

China Mining Industry Association

Wang Yangguo, Vice Chairman

Policy Research Department

Jiang Zhimin, Department Director

Shanxi State Development and Planning Commission

Wu Dongsheng, Director

Department of Industry

Wei Mingshi, Department Director

Shandong State Development and Planning Commission
Wang Hailin, Vice Director of Department of Fundamental Industry

China Development Research Consulting Center of Coal Industry
He Youguo, Vice Director
Pan Weier, Professor
Li Ruifeng, Chief
Ye Xudong, Engineer

China University of Mining and Technology
Wang Lijie, President Professor
Zhou Xinquan, Professor
Liu Haibin, Professor

Strategy Institute of Yankuang Group Co. Ltd
Niu Kehong, Vice President
Ji Juwen, Section Chief

China National Coal Association
Zhang Yong, Director

China Coal News
Yang Kai, Reporter

China Coal Information Institute
Dou Qingfeng, President
Hu Yuhong, Professor
Lan Xiaomei, Associate Professor
Fang Zhaozeng, Professor
Dong Weiwu, Associate Professor
Liu Xiaomin, Master Engineering

Participants from Foreign Companies

BHP Billiton China Limited Beijing Representative Office
Jon Coates, Representative of Energy Coal
Guo Hong, Analyst Energy Coal

a) Rio Tinto Limited Beijing Representative Office

Peter Eccleston, Vice President
Du Donghai, Manager

Shanxi Asian American Coal Co. Ltd. Office Taiyuan
Stephen X. Zou, Vice Executive President

Shanxi Asian American-Daning Energy Co. Ltd.
Li Jing, Operation Manager
Ronald Hite, Manager
Xu Jingshan, Interpreter

Anglo Coal Beijing Representative Office
Russ Phillips, Chief Representative
Steven Sun, Business Development Officer

PROCEEDINGS

CHINA COAL SECTOR DEVELOPMENT AND REFORM WORKSHOP

Beijing, December 11, 2003

**Workshop sponsored by the National Development and Reform
Commission and the World Bank**

A.5.47 The workshop was held at the Jade Palace Hotel, Beijing on December 11, 2003. The workshop was organized by China Coal Information Institute on behalf of the World Bank and NDRC. The aim was to present the results of two mine case studies, review the findings of previous work, and provide a platform for key Chinese organizations with coal sector management responsibilities to discuss ongoing reforms and developments.

A.5.48 The participants in the workshop included representatives from key central and local government agencies involved in coal sector administration, selected local mining companies, local offices of international coal mining companies, universities, and research institutes. The workshop agenda and participants are recorded in attachments 1 and 2.

Opening Comments

A.5.49 **Mr. Wu Yin, Energy Bureau, National Development and Reform Commission**, stated that coal is the major source of energy in China but reform of the coal mining sector lags behind those of other industries. Reforms in the power and railway sectors are assisting development of the coal mining business. However, production is not sufficiently well concentrated in large, efficient mining enterprises, the coal market is unstable, work safety is poor, and the enterprises carry heavy burdens. The administrative provisions are weak. A sustainable coal mining sector must be developed that will support the continuing economic growth of China. The World Bank studies are invaluable in assisting this process.

A.5.50 **Mr Yang Lu, Mineral Development Department, Ministry of Land and Resources**, outlined China's progress in opening the development of mineral resources to international investors. MOLAR will continue to exercise central control over the exploitation of mineral resources. Reforms proposed by government will clarify ownership of resource and standardize and protect the legal rights of holders of exploration and mining licenses. Resources will be allocated using competitive bidding processes. The Mineral Resources Law 1996 will be amended to ensure consistency with WTO rules. Improved administration, environmental protection, and greater use of clean coal technologies will reduce the pressure on the environment resulting from rapid economic development. The government encourages foreign enterprises to participate in modernization of the coal mining sector.

A.5.51 **Mr. Peter van der Veen, Manager, Mining Department, World Bank**, expressed the hope that the conference will contribute to the reform process and assist China to create a better coal sector, characterized by environmentally and socially responsible mining, with a climate conducive to private investment. There are three important reasons why improvement in the coal sector is needed: China's economic growth is reliant on coal for energy; China's coal sector is now the world's largest but also among the most dangerous and polluting; and while China's economic reform is accelerating and the restructuring of its power sector progresses, the development of the coal sector lags behind.

A.5.52 The coal mining industry in its current form is unsustainable due to the liabilities of many old state-owned mines, a poor investment climate, and excessive demands on the central government's budget. Key issues include the need to improve safety and recognize the high cost of accidents. Safety enforcement must be independent of local government influence. Small mines must either be upgraded or closed. Financial instruments and stronger enforcement should be introduced to underpin environmental protection. The use of dirty coal by small-scale consumers should be discouraged by use of financial instruments. Dormant reserves should be freed, access to data improved, and the terms of mining leases reduced. A level playing field will require a better investment climate, financial discipline, enforcement of bankruptcy, and cessation of illegal mining. International donor agencies, including the World Bank, can assist this process.

Presentation of Study Results

Key Challenges for China's Coal Sector

A.5.53 **Dr. Jerry C. Tien, University of Missouri-Rolla Missouri**, reviewed the findings of the MRI report on China's coal sector framework and included a comparative study of the development of the U.S. coal industry. Coal is a reliable and the most abundant energy resource in China. The coal industry has played a pivotal role in China's continuing economic growth. China has emerged as the world's largest coal producer and consumer, and the second-largest coal exporter, which has widespread impacts in the international coal market. China will continue relying on coal to meet its energy needs for a long time to come. Impressive progress has been made in reforming the coal sector but a number of challenges remain. Small coal mines have played crucial roles in society and the economy in the past 20 years but the safety, environmental, and efficiency standards are unacceptably low. The consumption of coal in general in China has had serious impacts on the environment. Coal reserves are depleted, and many mines are outdated. Although China has abundant coal resources, only 129 billion tons or 12.7 percent are proven minable reserves and of these at least 45 percent of them need further exploration. Some 180 large state-owned coal mines will be exhausted in the next few years. The investment climate is poor due to frequent policy change, bureaucratic delays, and a lack of transparency in approvals and licensing procedures; lack of available quality reserves; difficulties in acquiring geological, legal, and financial information critical to project evaluation; and export controls.

A.5.54 The MRI report recommends that small coal mining operations should be curbed, enforcement agencies should be wholly independent of local government and mining bureaus, and safety inspectors should be authorized to directly impose fines and suspend unsafe operations. Rigorous safety training programs should be adopted for all miners. To mitigate environmental impacts a national quality standard for coal product (ash, sulphur, etc.) should be considered. Environmental regulations must also be fairly and consistently enforced at all mines. Active coal exploration should be encouraged and adequate geological and coal lease information made readily available, in line with international practice. To facilitate foreign investment, all current policies and regulations

should be reviewed and modified to remove conflicts and ambiguities. Agencies with responsibility for coal sector administration should have their roles clarified to remove overlap, and approvals procedures should be streamlined. All nonmining social assets and infrastructure should be transferred into local government ownership. Economically sound, environmentally and socially sustainable mining activities should be fostered.

A.5.55 Dr. Tien then reviewed changes within the U.S. coal mining industry over the last century highlighting analogies to the current situation in China. Today, the U.S. coal industry is one of the safest and most productive in the world. In 2002 there were 1,480 coal mines, some 75,000 miners, an annual coal production of 995 Mt, and 27 fatalities. Dramatic improvements in health and safety, and environmental protection, in the past century have resulted from reducing the number of mines, fewer miners, larger mines, and increases in productivity. At the same time overall production increased. Since 1970 when the Clean Air Act was introduced, coal use has doubled, electricity use has trebled, and air quality has improved (SO₂ decreased 37 percent, PM₁₀ reduced by 65 percent and NO_x reduced by more than 25 percent). This demonstrates that coal use can be increased while at the same time improving air quality through application of clean coal technologies. Legislation in 1969 and 1977 contributed significantly to improved health and safety among miners, the introduction of safety training being particularly important.

A.5.56 In conclusion China has made impressive progress, but changes need to continue in respect of increased productivity, enhanced safety, improved environmental protection, and greater promotion of the efficient use of coal. There will be temporary difficulties, but ultimately long-term benefits will accrue.

Outline of the ESMAP Case Studies on Tianchi Mine and Shuangliu Mine

A.5.57 **Prof. Wang Lijie, China University of Mining & Technology, Beijing,** introduced the details of the mines investigated in the case studies. Tianchi mine lies in Guyao Village, 17 kilometers from the southern part of Heshun County, Shanxi Province. Tianchi mine was developed on the site of the former Guyao mine in Heshun, which started construction in 1956 and was put into operation in 1958. The mine output in 2001 was 0.15 Mt. In June 2003, the Tianchi Energy Company invested 0.26 billion Yuan to reconstruct the capacity to 1.2 Mt. The new mine has 145 Mt of available coal reserves. Reconstruction is about to start pending approval by NDRC. Shuangliu mine lies in Baijiayan Village, northwest of Liulin County, Shanxi Province. The mine was developed from a small mine, which was started in 1996 by Baijiayan Village and never put into operation. The design capacity of the small mine is 30,000 tpa. With the support of Liulin local government, Fenxi Mining Group merged the mine in 1998 and upgraded the capacity to 0.3 Mtpa. Trial production of Shuangliu mine began in June 2001, and the production reached 0.25 Mt in 2001. Fenxi Mining Group planned to develop Liliu mining area and upgrade the capacity of Shuangliu mine to 1.5 Mtpa. The production of Shuangliu mine in 2002 was 0.95 Mt, was expected to be 1.45 Mt in 2003, and planned to be 2.2 Mt in 2004. The area of Shuangliu mining area is 31 square kilometers and the reserves are 0.4 billion tons.

A.5.58 At each of the transformed mines, coal resources, access and approvals, mine management, productivity, environmental protection, safety management, and economic and social aspects were examined and the benefits of the large mine over the original small mines demonstrated. Administrative and management issues were discussed and the implications of extrapolating the best practices to the rest of China analyzed. Recommendations for increasing the effectiveness of existing reforms were made. It was concluded that both the local economy and the coal mining sector benefited from small to large mine transformations and suggested that more should be done to promote foreign and local large coal enterprises to upgrade small mines by introducing favorable policies.

ESMAP Case Studies: Issues, Conclusions, Recommendations

A.5.59 **Dr. David Creedy, Wardell Armstrong**, briefly reviewed the current status of China's coal mining sector and described the problems of safety accountability and targets; fatalities/Mt; occupational health; coal mine consolidation and transformation; small coal mine closures; environmental protection; coal washing and clean coal use; government intervention; and future investment needs.

A.5.60 The safety management, training, production, environmental, and welfare practices used at KSOCMs should be mandatory for all coal mines. The problem of small mine closure will not be solved by enforcement alone. Fundamental social and economic problems need to be resolved at the same time. More than 1.4 million new jobs will be needed if all the inefficient and hazardous small coal mines are to be closed. There are no policies or schemes currently addressing this problem. Coal sector administrative changes are needed. Provincial government should have a stronger licensing role but interfere less with the business activities of state-owned enterprises. The 0.6-Mtpa capacity criterion for referral to state level for approval should be removed as it delays new mine projects that have already been approved in principle and technically.

A.5.61 Safety conditions can be improved by application of KSOCM safety systems in all mines and developing risk assessment-based prevention. Occupational health protection comes under the State Administration of Coal Mine Safety (SACMS) but the Ministry of Health is responsible for monitoring miners' health. A link is needed to enable the effectiveness of health protection measures to be assessed and improved. The health of workers in small coal mines is not monitored.

A.5.62 Enforcement of environmental protection is weak although there are environmental planning and impact assessment procedures in place. Officials should be made accountable for failures, and local EPB capacity and resources should be strengthened.

A.5.63 Too little is known about the environmental impact of mine closure, and research should be carried out to quantify the problem. The use of low-quality coal should be controlled and incentives introduced to encourage clean coal use. Thus air quality can be improved in rural and urban areas.

A.5.64 Local government is closest to the mining activity and needs to be strengthened to enable it to deal effectively with the economic, social, and environmental aspects. Capacity building in respect of planning mine closure, economic development, and social mitigation is urgently needed. Local government needs greater powers to promote small mine consolidation and transformation and funds to enable it to supervise mine closure, undertake social and economic programs, and pay compensation for small coal mine closures.

Discussions on the World Bank Studies

A.5.65 **Mr. Jiang Zhimin, Director of Policy Research, Coal Industry Association**, commented that the development of China's coal industry faces many challenges and thought resources and work safety are two of the biggest challenges. The management of resources in China is rather out of order, the illegal and disordered mining in some small coal mines in particular has destroyed some coalfields that has brought about severe effects to China's coal industry. Another challenge is the problem of work safety. The situation of work safety in China is generally stable and turning for the better. However, the situation is still very grim. Three questions were raised:

A.5.66 **Q1:** The published recoverable coal reserves of China are 204 billion tons while the recoverable coal reserves of China evaluated by the International Energy Agency are 114.5 billion tons. I want to know the source of the 129 billion tons of recoverable coal reserves mentioned by Dr. Tien.

A.5.67 **Q2:** How does the U.S. government push forward investment in safety?

A.5.68 **Q3:** How much will the recovery of mine resources be improved after the merging and reform of the two coal mines in the case studies?

A.5.69 In responding, **Dr. Tien** said he would check his data sources with respect to China's coal reserves. Regarding the safety question, the U.S. government plays an auxiliary role in maintaining work safety in mining areas. It formulates the standards that mining areas should abide by from the viewpoint of legislation. The U.S. government has established the safety inspection agency, MSHA, which is responsible for enforcing standards on safety and health. No matter how comprehensively the laws and regulations are formulated, there are inevitably problems when enforcing them in practice. Therefore it has attached great importance to the training of safety inspectors. One chapter in the Mining Law of the United States focuses specifically on training. Safety awareness is deeply rooted in the life of miners. Very heavy penalties for failures that lead to accidents are specified in the U.S. laws and regulations.

A.5.70 **Dr. David Creedy** pointed out that there is a fundamental difference between the mine safety legislation in China and that in western countries. In China, mine management are held to rigid, precise, and prescriptive rules. In western mining companies, it is the responsibility of mine management to prescribe the particular rules for that mine, so, the law requires a mine manager to design safe systems of work. This method enables the mines to continuously improve their safety records.

A.5.71 **Dr. Tien** further emphasized the preceding point by adding that it is the concept of ownership of the safety management system that is important.

A.5.72 **Prof. Wang Lijie** answered the question on resources. At present, mining and exploration rights for resources in China are too cheap. China has only just started treating resources as assets. Resources have been neglected for a long time and some problems have occurred. The management of resources is currently in disorder as it is specified that resources with reserves of less than 100 Mt should be approved by the mining administrative department of each province. The result is that many big coalfields have been divided into small parcels for transfer. A better process would be for the coal department to work out the plan and make the geological departments responsible for the transfer of the resources. As for the issue of recovery, the expert team has paid great attention to it. Transformation of Tianchi coal mine will result in an estimated recovery of around 80 percent of the seam within each longwall panel and a whole mine recovery of about 30 percent of the resource compared with the original small mine, which achieved 10 percent to 15 percent from the whole mine. All in all, the resource recovery at both of the case study mines would be improved as a result of the transformation and consolidation.

A.5.73 **Q:** Mr. Zhu Deren:

A.5.74 The two cases concern the transformation of small coal mines into large mines but the case seems to be about setting up a new mine. How should the transformation be categorized? A technological reform, a reform of investment, or an organizational reform coordinated by the government?

A.5.75 In response, Prof. Wang Lijie suggested that the main issue was the expansion of an existing coal reserve to a much larger accessible reserve.

Reform Initiatives

Development Strategy of the Coal Industry in China

A.5.76 **Li Haofeng, Vice Director, NDRC, Energy Bureau**, outlined the current situation in China's coal sector, explaining its reform needs and the guiding principles of the government. In 2002, the total coal production in China was 1.4 billion tons and it ranked the highest in the world, accounting for about 29 percent of total world production. However, China's coal industry has not attained the same level of development as many of the main coal producing countries in the world. It is therefore necessary to enhance the development of the coal industry as soon as possible to facilitate a sustainable national economy. Coal sector developments and strategy are influenced by world coal mining trends and by the envisaged position and role of the coal industry in China's future economic development.

A.5.77 The government's development strategies are guided by the principles of exploiting scientific and technological advances; increasing the efficiency of resource recovery, coal mining methods, and coal use; implementing clean coal technologies;

improving safety; strengthening environmental protection; and making full use of human resources.

A.5.78 The development strategies will involve improving macro control, fostering a more transparent market, reforming ownership, enhancing human resource management, combining coal supply and downstream coal use industries (for example, coal mining and coal chemical industries), increasing the scale of mining enterprises, encouraging use of clean coal technologies, and improving work safety. Laws and regulations will be refined to establish a clear legal basis for all coal mining sector-related activities. This should be achieved within five to seven years.

Problems on Coal Enterprise Reform and Reorganization

A.5.79 **Zhang Jiwu, Vice President, Bureau of Enterprise Reform, State-Owned Assets Supervision and Administration Commission (SASAC)**, outlined the current status of enterprise reform. To date 70 percent of state-owned enterprises have completed the company system change and established a modern enterprise system. By 2003, among the top 500 enterprises in China, 368 were state-owned. In addition, 60 enterprises of the original 96 KSOCM coal enterprises had completed corporate system reconstruction, and 16 coal enterprises had been listed in domestic and foreign stock exchanges (for example, Yanzhou Coal Mining Company Limited and Zhengzhou Coal Industry & Electric Power Co., Ltd.).

A.5.80 There are two major problems facing state-owned coal enterprises: historical financial burdens and inefficiencies causing lack of working flexibility. Current enterprise reform is being guided by the decision of the CPC Central Committee on issues regarding the improvement of socialist market economic system made by the third plenary session of the 16th CPC Central Committee. A central State-Owned Assets Supervision and Administration Commission of the State Council has been established, and more than half of the provinces and cities of China have established local State-Owned Assets Supervision and Administration Commissions.

A.5.81 In the last five years, the transaction volume of enterprise mergers and acquisitions in China increased at the rate of 70 percent per year. From April to September in 2003, the State-Owned Assets Supervision and Administration Commission approved property rights and asset sales by 48 enterprises involving 20.5 billion Yuan of state-owned capital, rights, and interests. Bankruptcy law is under revision in China. For enterprises that are on the verge of bankruptcy, debt restructuring is conducted first, and only if this failed, will the enterprises be closed and bankrupted. There are two kinds of bankruptcy in Chinese enterprises: bankruptcy by law and bankruptcy by policy.

Regulation and Normalization of Management of Coal Resources and Protection and Rational Utilization of Coal Resources

A.5.82 **Bo Zhiping, Vice Director, Department of Mining Management, Ministry of Land and Resources**, explained that the Ministry of Land and Resources is responsible for planning, management, protection, and rational utilization of mineral resources. The administration of coal resources is enforced mainly through approval and

issue of exploration and mining permits, supervising exploration and mining, and levying a compensation fee for mineral resources.

A.5.83 In China the total value of output of the coal industry accounts for more than one-third of the total value of output of minerals. Although the number of large and medium coal mines is less than 2 percent of the total, production and productive value account for more than one-half and the employees for more than one-third of the total. The great majority of mines are small coal mines. The average per capita production and output of small coal mines are only one-fifth of the large coal mines.

A.5.84 The coal industry in China has made a great contribution to relieving tight energy supply and assisting economic growth but some problems also exist, such as uncontrolled development of small coal mines, application of low-level technology, waste of coal resources, and illegal transfer. Since 2001, the Ministry of Land and Resources treats improvements in the administration of national mineral resources as a high priority. The phenomenon of illegal mining has been suppressed successfully and the number of legal small coal mines decreased year by year. According to the statistics, there were 43,790, 35,240, 30,510, and 27,580 small coal mines in 1999, 2000, 2001, and 2002, respectively (corresponding to annual decreases of 19.5 percent, 13.4 percent and 9.6 percent). Special emphasis is being directed at the northeast to assist economic development by strengthening geological prospecting, introducing a preferential policy regarding mineral resources tax, supporting corporate system reform of state-owned mining enterprises, increasing the protection of mine ecological environments, and assisting rehabilitation. Ministry of Land and Resources is working to improve the supervision and management of coal resources in general.

Status of Mine Safety and Countermeasures and Recommendations

A.5.85 **Shang Dengying, No. 2 Department of Coal Mine Supervision of SAWS**, reported that some improvement in coal mine safety can be claimed in 2003 but the situation is still grim. The fatality rate per Mt of coal produced was 3.9, a 22 percent decrease compared with the corresponding period of the last year. Gas explosions account for 70 percent of the accidents involving three or more people. Over 70 percent of the fatalities occur in TVCMs. High risks, low wages, and the financial difficulties experienced by many mines are contributory factors. There is a serious lack of safety equipment. There are no stand-by fans in most TVCMs. Of the 25,586 TVCMs only 2,695 have installed gas monitoring systems. Only 337 gas monitoring systems have been installed in 609 KSOCMs. The large number of small mines and local protectionism are problems for safety enforcement.

A.5.86 Measures are in hand to promote safer working practices, strengthen administrative responsibilities, involve local government, enforce laws and regulations, increase the scale of mining operations, close unsafe small mines, raise technical competence, improve safety training, implement incentive and punishment schemes, establish an industrial injury insurance system for employees, and raise safety awareness among workers and the public.

Clean Coal Technologies and Air Pollution Control in China

A.5.87 **Wei Honglian, Pollution Control Department, SEPA**, described the current status of coal utilization and its impact on air pollution in China. Only about one-fourth of the coal produced is washed. The average ash content of coal is 20.5 percent and the average sulphur content is 0.8 percent. Technology for clean coal utilization is relatively backward. Eighty percent of coal produced in China is directly used for coal-fired electricity generation, in industrial boilers and kilns and for domestic and commercial purposes. Coal for power stations accounts for about one-third of the total consumption. The industrial boilers and domestic coal consumers are widely dispersed. There are 0.5 million industrial boilers and 160,000 industrial kilns in China with an average capacity of 2.4 tons only. The coal-fired equipment with small capacity, scattered distribution, and obsolete technology results in low efficiency of coal utilization and high energy consumption. The average efficiency of coal utilization is only about 30 percent, some 10 percent less than the international level.

A.5.88 In 2001, some 19.5 Mt SO₂ was discharged in China causing serious acid rain problems. Acid rain causes 20 billion Yuan of direct economic loss every year in China. Particulate matter is one of the main pollutants produced during coal combustion.

A.5.89 The average annual concentrations of particles in 64 percent of cities exceed Class 2 of national air quality. The particles mainly come from the smoke discharged by industrial boilers and domestic stoves. Coal burning by industrial boilers accounts for 33 percent of coal consumption in China but the contribution to atmospheric pollution exceeds 50%. Coal consumption in domestic stoves accounts for only 15 percent of the total consumption but its contribution to atmospheric pollution accounts for 30 percent. Clean coal technology is therefore seen as essential for both reducing pollution and increasing utilization efficiency during coal exploitation. Important precombustion clean coal technology processes include coal washing, briquetting, gasification, and coal-water slurries. There is also a range of advanced combustion technologies that are less polluting than conventional pulverized fuel boilers and technologies for cleaning stack emissions.

A.5.90 Policy and management measures for coal clean utilization include encouraging greater use of clean coal, restricting the production of coal with high sulphur and ash contents, regulating atmospheric discharges, introducing rising discharge penalties, defining smoke-free zones, and limiting SO₂ emissions from power plants.

Panel Discussion

A.5.91 **Question by Russ Phillips (Anglo Coal):** On the issue of loan defaults by mining enterprises. The properties for such mining enterprises are fixed assets and there must be clear definition in terms of being authorized for the right of mining. If a foreign investor cannot obtain the right of mining, then the investment in this sector will not be that attractive to him. How is the ownership of the right of mining adjusted after financial restructuring? How is it adjusted in the debt-to-equity exchange process?

A.5.92 **Answer by Mr. Li Haofeng (NDRC):** The two questions of a bad loan and the right of mining seem to be one question to me. The estimation of the right of mining and the general adoption of market principle for resources have been clearly specified in the Law on Mineral Resources and its auxiliary laws and regulations. A lot of work has been done in this area and many difficulties have been encountered in the course of enforcement but more needs to be done to clarify these issues. Director-General Zhang from the State-Owned Assets Supervision and Administration Commission has introduced some information in this aspect. As for the estimation of the right of mining, we can take the right of mining as the capital invested for the project or the enterprise as a kind of asset. Generally speaking, the transfer of the right of mining and the general adoption of market principle will be more regulated in the future. The Ministry of Land and Resources is also doing something in this aspect. We'll work together in respect of resources management. As for the authorization of the right of mining to foreign ventures, China has made the commitment openly when entering the WTO that foreign ventures will enjoy the same treatment as domestic enterprises.

A.5.93 **Question by Mr. Mu Dewei (U.S. Embassy to China)**

A.5.94 **Answer by Dr. Wei:** The environmental protection office under the former Ministry of Coal Industry (MCI) was in charge of the management of environmental impact before the reform and opening of China. After the administrative reform in 1998, the MCI was abolished as well as the environmental protection office. A department under the State Environmental Protection Administration (SEPA) is now doing the job. Coal mines can produce various impacts upon environment, such as ecology, underground water, and atmosphere. It's a difficult and complicated job for the department under SEPA to manage. Pollution charges are imposed based on total emissions of pollutants without any concern over the concentration. Taking a coal-fired power plant as an example, the charges are collected only for the total emission of the three major pollutants (SO₂, NO_x, and smoke). However, there are no clear regulations on how to make the charges for operating coal mines and for which kind of pollutant the charge will be collected. There is a department entrusted with collecting pollution charges and they can be consulted for more details.

A.5.95 **Delegate from Shanxi Coking Coal Group:** Question 1 is on the issue of land and resources. Thirteen coal bases have been set up by the state in developing its large-scale coal group strategy. Has the Ministry of Land and Resources taken into consideration how to guarantee the availability of resources to these groups?

A.5.96 Question 2: When will the State solve the problem of coal profit transfer? The issue of coal profit transfer actually involves the issue of financing the construction capital for the railway sector. An additional small question is whether a coal mine development fund will be established in the future.

A.5.97 **Answer by Mr. Li Haofeng (NDRC):** Question 1 asks how to guarantee the resources for the big coal groups. The NDRC has taken this into account and the coal bases are divided according to the regions of resources. In developing the big coal base

strategy, exploration of resources should be carried out further to improve the degree of guarantee of coal reserves. We should also strengthen the categorization of coal resources into state planning areas (Division 1), mining areas of national importance (Division 2), and coal type (with special regard to coking coal and other types in short supply). More strict measures will be taken to administer the resources not belonging to the above categories of “two divisions and one coal variety” to improve the efficiency of these resources.

A.5.98 **Question 2 on coal profit transfer.** This issue is really one of utilization of coal resources. The west-to-east power project is aimed at solving the problem of profit transfer locally. We are trying to change the original idea of transporting coal to that of delivering power. Coal development in the future must persist in the principle of unified planning, rational winning, and comprehensive utilization. The problem of railway fund raising will constrain coal sector development as coal mines will have to pay more than 10 billion Yuan. We are now working on it and the state is studying the issue of systematic reform in the railway sector. There is little chance for the establishment of a coal fund. The development of coal industry needs capital investment. In the short term, the state is to invest in large-scale coal mines within the big coal bases and subsidize exploration and development by state-owned enterprises.

A.5.99 **Question by Mr. Zhu Deren (Chairman):** Two small coal mines were transformed through the way introduced in the case studies. How many small mines can be transformed in this way in China? What is the major difficulty?

A.5.100 **Answer by Mr. Wang Lijie:** The problem of small mines is a concern to all. Small coal mines are the result of a historical response to coal shortages. At the expenses of safety, small mines have been overdeveloped and they have brought about hazards to the environment as well as destroying coal resources. The state has concluded that the number of small mines should be gradually decreased and large-scale coal mines should be developed instead. There are three basic modes to consider. Mode 1 can be exemplified by Yujialiang mine where a large number of small mines were closed over a wide area and replaced by a single large-scale mining operation. The local government charges a lease of 10 Yuan/ton of coal produced. Mode 2 involves the situation where resources exist but development is constrained by lack of capital such as at Shuangliu coal mine, which was bought out and expanded. This mode can bring about both economic and social benefits. Mode 3 is to turn the small mine into a stakeholder in the transformation to a larger mine as was the case with Tianchi. However, all the three modes cannot be practiced without the assistance of the local government. The key point of the question put forward by President Zhu is how to transfer some profit to the local government, which is the most difficult part. Why are so many small coal mines operating in such disorder? The major reason is the support of the local government. Seventy percent of the fiscal incomes of the two counties where the case studies were undertaken came from the small mines. Legal small mine operators should be compensated financially for closure, and transformations should bring clearly identified benefits to the immediate local governments. As for the proportion of the small mines to

be reformed, it's hard for me to say. However, I think the three modes are all of wide significance of universality currently. The problems of small mines occur at local "grassroots" level but the source of a solution lies at government level.

A.5.101 **Dr. David Creedy** added that local revenue problems should not arise where there are good transformation and consolidation prospects for small mines but there is still the unemployment problem issue to address for which there is currently no policy. In general, the small mine closure problems will not be solved until appropriate social and economic policies are in place.

Concluding Comments

A.5.102 **Mr. Wu Yin on behalf of NDRC** summarizes: The meeting has concentrated on the coal mining industry and how to promote its reform and development. Many opinions and ideas have been proposed, and the debate will contribute significantly to formulation of relevant policies. The development of the coal industry has been rapid since the reform and opening up to the outside world over the last 20 years. In particular the coal output has supported the development of the national economy, some world class coal mining operations have been established, and safety is starting to improve.

A.5.103 However, there are still many problems in the coal industry and these are an inevitable part of the development process in changing from a planned economy to a market economy. Functions that require the government to strengthen its management are backward. The coal industry is facing an arduous task in that it must solve both existing problems and at the same time significantly increase its output to support the continuing economic development of China. It is known to everyone that coal is in short supply for China's power sector. Is it a must that the economic development should always be supported by coal or energy? It can't be that the coal sector should develop as much as the economy develops. That is to say, we should take a new path of economic development with low energy consumption and low environmental pollution. We should not only handle the problems of energy but also pay attention to the coordinated development of society.

A.5.104 In recognition of the above, the energy department of NDRC is now coordinating with other relevant government departments including those concerned with energy management, safety management, financial, and taxation. The experience and lessons of foreign countries gained through World Bank projects and international seminars will help China to make the rapid changes needed in as short a time as possible.

A.5.105 My colleague, Mr. Li, has introduced the train of thoughts and strategy of the development of coal industry of the country. They can be summarized as follows:

1. How to manage and plan well the energy of China to guarantee the effective development and utilization of energy.

2. Laws and regulations should be formulated. The development of enterprises should be regulated through the enforcement of laws and regulations.

3. The structure of coal industry should be reorganized; large group corporations should be established and small coal mines transformed.

4. How to develop clean coal technology and protect the environment.

A.5.106 I hope we'll keep in touch and have some further discussions in order to promote the development of the coal industry of China. Finally, my thanks to all participants present, the organizers, interpreters, and sponsors of the conference!

A.5.107 Mr. Peter van der Veen, World Bank, closed by highlighting needed actions:

A.5.108 **For safer and healthier mines:** Enforcement capacity should be independent of local government and systematically strengthened, and small mines that can't be improved to meet minimum safety standards should be consolidated into larger ones or closed.

A.5.109 **For reduced environmental impact of mining:** To reduce the extensive and widely distributed land disturbance and water pollution and encourage systematic reclamation of mining areas, the government needs to revise the assessment and monitoring procedures, introduce a system of financial instruments to underpin environmental management plans, strengthen local institutional capacities for enforcement, and ensure permanent closure of small mines that can't comply.

A.5.110 **For cleaner coal for small consumers:** An incentive structure in the form of a taxation (and crediting) system could be introduced to control sulphur and a heat-based pricing system to control ash.

A.5.111 **For open access to coal resources:** To free up dormant coal resources and make the existing publicly held regional geological data available, the Ministry of Land and Resources and provincial geological bureaus could review the availability of data and adopt appropriate regulations to disseminate this to interested parties, introduce progressive annual holding fees to discourage speculation and hoarding, and limit licenses to reasonable periods.

A.5.112 **For a level playing field for mine operators:** All actions referred to earlier would be important. In addition, market intervention should be reduced, financial discipline and bankruptcies enforced wherever needed, and illegal mines must be phased out/closed. Mr. van der Veen hoped that the meeting can identify and prioritize the most pressing issues facing the coal mining industry, suggest remedies, and agree on an overall action program to move the industry forward in a way that is both economically viable and environmentally sustainable. The government should pay close attention to private investment and foreign private investment, so the rule of the game is very important. Transformation and consolidation cannot solve all the problems. The small mines with too low efficiency, high pollution, and excessive dangers should be closed. On behalf of

the World Bank, he hoped that the Chinese government, especially the NDRC would move this agenda forward. The end of the workshop does not mean the end of the process but the beginning of working together toward a sustainable solution.

Attachment 1 : Workshop Program

9:30-9:00 a.m.	<i>Registration</i>
9:00-9:50 a.m.	Welcome/opening comments - Wu Yin, Vice President, Energy Bureau of NDRC - Yang Lu, Vice President, Department of Mining Management of Ministry of Land and Resources - Peter van der Veen, Manager, World Bank - Introduction of workshop program (Li Haofeng, Vice Director, Energy Bureau, NDRC)
9:50-10:20 a.m.	Key Challenges for China's Coal Sector J. Tien, Ph.D., University of Missouri-Rolla
10:20-10:50 a.m.	<i>Coffee/Tea Break</i>
10:50-11:20 a.m.	Case Studies of Tianchi Mine and Shuangliu Mine Wang Lijie, Professor, China Mining University <i>Building a Sustainable Coal Mining Sector in China</i> D. Creedy, Ph. D., Wardell Armstrong
11:20-12:15p.m.	Discussion of study results
12:15-2:00 p.m.	<i>Lunch</i>
2:00-3:15 p.m.	PRESENTATION OF REFORM INITIATIVES BY THE GOVERNMENT Development Strategy for China's Coal Sector Li Haofeng, Vice Director, Energy Bureau, NDRC Problems of Coal Sector Reform and Restructuring Zhang Jiwu, Vice President, Enterprise Reform Bureau, SAAC Regulation and Normalization of Management of Coal Resources Protection and Rational Utilization of Coal Resources Bo Zhiping, Vice Director, Department of Mining Management, Ministry of Land and Resources Mine Safety and Health: Present Status and Countermeasures and Suggestions Shang Dengying, Vice President, Department Two of Coal Mine Safety Supervision of SAWS Clean Coal Technologies and Air Pollution Control in China Wei Honglian, Ph.D, SEPA
3:15-3:45 p.m.	<i>Coffee/Tea Break</i>
3:45-4:45 p.m.	Discussion of reform issues Panel of experts from government, industry, and academia
4:45-5:10 p.m.	Closing comments (NDRC and World Bank)

Wu Yin, Vice President, Energy Bureau, NDRC

Peter van der Veen, Manager, World Bank

5:40-7:40 p.m.

Dinner

Moderators: Zhu Deren, Vice President, China Coal Industry Association, and Li Haofeng, Vice Director, Energy Bureau, NDRC

Attachment 2: List of Participants

Foreign Participants				
	<i>Name</i>	<i>Title</i>	<i>Company</i>	<i>Telephone</i>
1	Peter van der Veen	Manager	Mining Department, World Bank	
2	Charles Husband	Lead Mining Specialist	Mining Department, World Bank	
3	Zhao Jianping	Senior Energy Specialist	World Bank Office Beijing	
4	Jerry C. Tien.	Professor of Mining Ph.D.	University of Missouri-Rolla	
5	David Murphy	First Secretary	U.S. Embassy	010-65323831
6	Christian Merchant	Science Technology Officer	U.S. Embassy	010-65323831
7	Caroline Perkins	Economic Officer	U.S. Embassy	010-65323831
8	Helen Hudson	First Secretary	U.S. Embassy	010-65323831
9	Nicola Willey	First Secretary Environment	British Embassy	010-65321961
10	Deng Yongzheng	Program Manager	UNDP	010-65323731
11	He Ping	Program Manager	UNDP	010-65323731
12	David Creedy	China Business Director	Wardell Armstrong	010-64240946
13	Jiang Suying	Commercial Representative	Wardell Armstrong	010-64240946
14	Kang Lei	Market Analyst	BHP Billiton China	010-65881800
15	Du Donghai	Business Analysis Manager	Rio Tinto Beijing Representative Office	010-65057290
16	Russ Phillips	Chief Representative	Anglo Coal Beijing Representative	010-

			Office	65188888
17	Steven Sun	Business Development Officer	Anglo Coal Beijing Representative Office	010-65188888
18	Yang Jianzhen	Business Development Officer	Anglo Coal Beijing Representative Office	010-65188888
19	Pierce Li	Project Manager	Asian American Coal, Inc.	0351-8689080

Chinese Participants				
	<i>Name</i>	<i>Title</i>	<i>Company</i>	<i>Telephone</i>
1	Wu Yin	Deputy President	Energy Bureau, NDRC	
2	Li Haofeng	Vice Director	Energy Bureau, NDRC	
3	Yang Lu	Deputy President	Department of Mining Management, MLR	010-66558578
4	Bo Zhiping	Vice Director	Department of Mining Management, MLR	010-66558252
5	Zhang Jiwu	Vice President	Bureau of Enterprise Reform, SASAC	010-63193089
6	Wu Xiaoyu	President	Department of Policy and Legislation, SAWS	010-64463140
7	Shang Dengying	President	Department Two of Coal Mine Safety Supervision, SAWS	010-64463097
8	Yang Qingsheng	Director	Department of Policy and Legislation, SAWS	010-64463024
9	Wei Honglian	Ph.D.	State Environmental Protection Administration of China	010-66154879
10	Zhu Deren	Vice President	China National Coal Association	
11	Jiang Zhimin	Director	China National Coal Association	010-64463574
12	Huang Shengchu	Vice President	China Coal Information Institute	010-84657818
13	Hu Yuhong	Director	China Coal Information Institute	010-84657806
14	Geng Zhicheng	Deputy Professor	Energy Research Institute of NDRC	010-63908553
15	Cui Tao	Deputy Chief Editor	China Coal Newspaper	010-64463089
16	Xu Wanguo	Reporter	China Coal Newspaper	010-

				64463963
17	Luo Xiaorong	Reporter	China News Service	
18	Hong Yan	Reporter	Chinese People's Political Consultative Conference	
19	Wei Mingshi	Director	Shanxi (SDPC)	0351-3119218
20	Yang Ruiping	Director	Inner Mongolia (SDPC)	0471-6917153
21	Wang Hailin	Vice Director	Shandong (SDPC)	0531-6915720
22	Sun Yufang	Vice Director	Liaoning (SDPC)	024-86901229
23	Guo Xiaohe	Vice President	Henan (SDPC)	0371-5953785
24	Wang Minghua	Director	Shanxi (SDPC)	029-7294250
25	Zhou Jingyu	Vice Director	Hebei (SDPC)	0311-8600514
26	Li Rongkai	Vice Director	Heilongjiang (SDPC)	0451-82631676
27	Chen Jialin	Vice Director	Anhui (SDPC)	
28	Xiang Changquan	Vice Director	Guizhou (SDPC)	0851-5284770
29	Lin Yingman	Vice Director	The Land and Resource Department of Henan	0371-5962312
30	Wang Zhonghua	Vice Director	The Land and Resource Department of Heilongjiang	0451-55603937
31	Bu Fangqin	Vice Director	Shanxi Provincial Coal Industry Bureau	0351-4117273
32	Yu Xiuzhong	Director	Shandong Provincial Coal Industry Bureau	0531-5685634
33	Jin Cheng	Vice Director	Coal Industry Bureau of Inner Mongolia	
34	Baihong	Director	Shanxi Provincial Coal Industry Bureau	029-7671818
35	Wan Jiali	Vice Director	Henan Provincial Coal Industry Bureau	
36	Liu Shilu	Deputy Chief Engineer	Henan provincial SAWS	0371-3838850
37	Xu Zhancheng	Chief Engineer	Shanxi provincial SAWS	0351-

				4115686
38	Huang Zisheng	Director	Shanxi provincialSAWS	0351-4117510
39	Wang Lijie	Dean	China University of Mining Technology (Beijing)	010-62311667
40	Zhou Xinquan	Dean	China University of Mining Technology (Beijing)	010-62331942
41	Liu Haibin	Dean Assistant	China University of Mining Technology (Beijing)	010-62341413
42	Zhang Wenjiang	President	Ningxia Mining Group	0951-6970199
43	Wang Yuan	Chairman of the Board	Huainan Ming Group	0554-7624059
44	Yang Lin	Director of Secretariat	Huainan Ming Group	0554-7624059
45	Zhang Yong	Director	China National Coal Group	
46	Wang Jianhua	Deputy Chief Engineer	Shanxi Coking Coal Group	
47	Xie Youqian	Vice Manager	Planning Department, Shenhua Group	
48	Wu Yaping	Director	Planning Department, Shenhua Group	010-64485023
49	Tian Guogang	Vice Director	Kailuan Mining Group	010-64485249
50	Ma Jinping	Vice Director	Kailuan Mining Group	0315-2816031
51	Ma Jianqiang	Secretary-General	Yanzhong Mining Group	0315-2816031
52	Geng Yude	Senior Engineer	Yanzhong Mining Group	
53	Yin Mingde	Vice President	Yankuang Shanxi Energy Chemical Company	
54	Tian Qizhu	Deputy Chief Engineer	Yankuang Shanxi Energy Chemical Company	0354-3071879
55	Li Guifang	Deputy Chief Engineer	Fenxi Mining Group	
56	Deng Shiming	Fund Manager	Dacheng Fund Management Co.	010-66413888
57	Shi Yonghui	Senior Analyst	Dacheng Fund Management Co.	010-66413888
58	Cheng Jinfang		Jincheng Mining Group	

Annex 6

SELECTED HISTORICAL DATA ON CHINA'S COAL SECTOR

Table A6.1. China's Primary Energy Consumption and its Mix (1980–2000)

	<i>Total Consumption (in million tons)</i>	<i>Coal</i>	<i>Oil</i>	<i>Mix, %</i>		
				<i>Natural Gas</i>	<i>Hydro Power</i>	<i>Nuclear Power</i>
1980	602.8	72.2	20.7	3.1	4.0	
1985	766.8	75.8	17.1	2.2	4.9	
1990	987.0	76.2	16.6	2.1	5.1	
1995	1,311.8	74.6	17.5	1.8	5.7	0.4
1996	1,389.5	74.7	18.0	1.8	5.1	0.4
1997	1,381.7	71.5	20.4	1.7	5.8	0.4
1998	1,322.1	69.6	21.5	2.2	6.3	0.4
1999	1,301.2	68.0	23.2	2.2	6.2	0.4
2000	1,280.0	67.0	23.6	2.5	6.4	0.5

Note: Hydro and nuclear power is calculated according to the specific fuel consumption for power generation.

Source: State Statistical Bureau (SSB).

Table A6.2. China's Raw Coal Output (1980–2000, in million tons)

1980	620	1991	1,087
1981	622	1992	1,116
1982	666	1993	1,150
1983	715	1994	1,240
1984	789	1995	1,361
1985	872	1996	1,397
1986	894	1997	1,373
1987	928	1998	1,250
1988	980	1999	1,045
1989	1,054	2000	1,000
1990	1,080		

Source: SSB.

Table A6.3. Raw Coal Output by Province (1980–2000, in million tons)

	1980	1995	1996	1997	1998	1999	2000
National	1,079.3	1,360.7	1,396.7	1,372.8	1,250.0	1,045.0	1,000.0
Beijing	10.0	10.0	10.0	10.1	10.1	9.9	6.0
Hebei	61.9	81.0	81.7	78.8	58.0	55.1	58.0
Shanxi	285.9	347.3	348.8	338.4	314.8	248.9	196.0
Inner Mongolia	47.6	70.6	73.1	83.0	77.7	70.7	72.0
Liaoning	51.0	56.3	60.4	58.8	57.9	47.8	45.0
Jilin	26.1	26.4	26.0	26.8	21.3	16.3	16.0
Heilongjiang	82.6	79.4	82.0	85.2	70.9	62.3	50.0
Jiangsu	24.1	26.5	26.1	25.1	23.8	22.9	25.0
Zhejiang	1.4	1.3	1.2	1.2	0.9	0.8	1.0
Anhui	32.1	44.4	50.9	49.0	45.0	45.2	47.0
Fujian	9.3	11.3	11.7	7.8	7.3	4.6	4.0
Jiangxi	20.3	28.8	24.4	20.6	21.1	17.3	18.0
Shandong	60.0	88.3	89.5	90.9	89.8	90.0	80.0
Henan	90.8	103.3	107.8	105.2	94.1	105.2	76.0
Hubei	9.2	15.3	15.2	15.2	13.3	15.2	4.0
Hunan	33.7	55.7	59.9	44.1	43.5	44.1	15.0
Guangdong	8.9	10.7	9.6	8.4	8.0	8.4	2.0
Guangxi	9.8	13.9	12.5	11.1	10.2	11.1	7.0
Hainan	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sichuan				62.2	56.8	62.3	21.0
Chongqing	67.9	95.6	96.3	29.3	25.7	29.3	11.0
Guizhou	37.0	54.7	61.4	65.8	65.7	66.0	37.0
Yunnan	22.3	28.0	30.7	33.0	30.9	33.0	10.0
Xizhang	0.0	0.0	0.0	0.0	0.0	0.0	
Shaanxi	33.3	42.5	46.1	49.5	22.8	49.5	20.0
Gansu	15.6	24.7	22.2	22.9	23.2	22.9	16.0
Qinghai	3.2	2.8	3.0	3.3	3.2	3.3	1.0

Ningxia	14.4	14.8	16.2	16.7	15.8	16.7	16.0
Xinjiang	21.0	27.2	29.9	30.2	29.0	30.2	27.0

a. 228.5 Mt according to the State Administration of Coal Industry.

Source: SSB.

Table A6.4. Raw Coal Output by Ownership (in million tons)

	<i>Total</i>	<i>State-Owned Key Coal Mines</i>	<i>State-Owned Local Coal Mines</i>	<i>Township and Village Coal Mines^a</i>
1980	620.1	344.4	162.1	113.6
1985	872.3	406.3	182.8	283.2
1990	1,029.9	480.2	205.1	394.6
1995	1,360.7	482.3	213.4	665.0
1996	1,396.7	537.3	222.1	637.3
1997	1,372.8	529.2	225.7	617.9
1998	1,250.0	503.5	212.9	533.6
1999	1,045.0	512.7	213.9	318.4
2000	1,000.0	534.0	199.0	256.0

a. TAV coal mines included private coal mines.

Source: SSB

**Table A6.5. Raw Coal Output of Township and Village Coal Mines
(1990–2000, in million tons)**

	<i>1990</i>	<i>1995</i>	<i>1997</i>	<i>1999</i>	<i>2000</i>
Total	394.0	596.6	570.4	317.0	255.8
Beijing	3.9	5.0	4.9	3.5	2.5
Hebei	13.4	22.5	19.2	10.5	8.4
Shanxi	133.0	169.9	154.2	79.5	78.7
Inner Mongolia	13.0	28.0	33.1	16.8	13.2
Liaoning	10.4	14.9	13.2	7.8	5.3
Jilin	9.2	9.7	7.8	4.5	3.5
Heilongjiang	21.0	22.7	22.6	12.3	6.1
Jiangsu	2.8	4.2	4.0	2.5	2.0
Zhejiang	0.1	0.2	0.3	1.0	0.1

Anhui	3.4	6.0	5.9	3.3	2.7
Fujian	4.0	3.8	3.6	2.0	1.4
Jiangxi	8.4	12.9	11.5	8.0	6.8
Shandong	10.8	20.0	19.9	5.9	3.4
Henan	31.0	42.1	38.8	22.6	20.0
Hubei	6.1	11.6	12.6	6.8	4.5
Hunan	18.9	35.3	28.4	15.1	9.7
Guangdong	4.5	6.9	5.7	3.3	3.3
Guangxi	3.5	6.2	5.5	2.8	1.9
Sichuan			40.6	25.4	20.6
Chongqing	32.6	63.8	14.5	9.1	6.6
Guizhou	24.2	41.7	53.7	27.3	22.9
Yunnan	12.7	18.0	21.2	16.7	12.6
Shaanxi	13.9	19.8	24.2	12.3	6.5
Gansu	4.7	11.6	8.7	4.9	2.6
Qinghai	0.6	0.9	1.0	0.8	0.6
Ningxia	1.4	1.8	2.7	1.7	1.7
Xinjiang	6.9	12.2	13.0	11.5	8.5

Source: SSB

Annex 7

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