

The regulation of China's township and village coal mines: a study of complexity and ineffectiveness

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Abstract

An appropriate system of laws and regulations and a suitable institutional structure for administration are important requirements for the effective management of small-scale mines. Over the last twenty years, township and village coal mines in China have made a large contribution to the country's supply of energy. Yet at the same time they have had substantial negative impacts, such as wastage of coal resources, a high casualty rate amongst miners, and a wide range of environmental damage. Two reasons for the magnitude of these externalities are the highly complex nature of the institutional structure for regulating small-scale coal mines, and the excessive and incoherent burden of applicable laws and regulations.

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1. Introduction

Small-scale mines continue to defy all but the most vigorous regulatory measures. Over the years, formal and informal international groups have drawn up agendas, guidelines and programmes for effective regulation [1–5]. Nearly all the reports from these groups have identified the same range of issues that need to be addressed in order to promote the sustainable development of small-scale mining: legal and institutional frameworks, technology, training, finance and taxation. Despite the relative clarity and consistency of these recommendations, few governments have implemented them with any measure of sustained success.

In most countries, there are three main barriers preventing effective management and regulation of small-scale mines. The first is a combination of political opposition, vested interests and ineffective government. A

policy for small-scale mining can only be implemented effectively if the interests of most or all relevant parties are adequately addressed [6]. The second impediment is the inadequate or inappropriate nature of national regulatory regimes for small-scale mines, which includes both the system of laws and regulations and the institutional structure [1,7–11]. The third obstacle is a lack of financial resources to implement policies. The second of these—the system of regulation—is the focus of this paper.

What emerges from these and other works is that small-scale mining requires a simple system of laws and regulations and a specific system of institutional support from the government, which in turn requires a substantial and sustained level of funding. Colombia provides an example of how an intensive period of government action funded by royalties paid by large-scale mines brought great benefits to the small-scale coal mining sector in a relatively short period of time [12,13]. The Zimbabwean experience shows how public pressure can impose self-regulation on small-scale mines, which reduces the cost of governmental regulation [14].

China has the largest small-scale mining industry in

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the world in terms of production and employment. Output in 1999 was valued at US\$24 billion, and employment exceeded four million [15]. However, given the poor statistical compilation procedures prevalent in developing countries, these figures are likely to represent vast underestimates. Coal accounts for some one-quarter of the output value of all small-scale mines, and as much as 50% of China's small-scale mining workforce is employed at coal mines [15].

Since 1998, China's small-scale coal mines have experienced a period of crisis management as a result of the government's reaction both to the short-term over-production of coal, and to the appalling long-term safety and environmental record of the sector. The objective of this paper is to examine the regulatory regime for small-scale coal mining in China during the 1990s, and to show how this regime has contributed to the current crisis. We first provide a brief summary of the development of the small-scale coal mining industry in China over the last twenty years before examining the system of laws and regulations, and the overall institutional structure.

The paper provides a general view of the complexity of the regulatory system, and illustrates how inappropriate it is for the government, miners and Chinese society as a whole. A detailed analysis of the raft of relevant laws and regulations is beyond the scope of this account. An additional constraint concerns the ability of any outsider (or even insider) to determine exactly how the institutions are structured and operate. Our analysis of the workings of government is based on interviews carried out in Beijing and in Shanxi Province in 1999, official documents and academic papers. The reforms announced in 2001 are not examined in detail.

2. The growth of the township and village coal mines in China and their impact

2.1. Twenty years of TVCM development

China's production and consumption of coal was the largest in the world during the 1990s. Between 1995 and 1997 annual production lay in the range 1,350–1,400 million tonnes, although net exports amounted to just 30 million tonnes. Coal accounted for nearly 75% of primary energy production and consumption [16,17]. Some 45%, or more than 650 million tonnes, of this production came from 75,000–80,000 so-called township and village coal mines ("TVCMs"), a large proportion of which are owned and controlled by local governments at the township and village level. A substantial minority of these mines, usually the smaller ones, are privately-owned. Others are owned by a variety of state companies and agencies, including the army and prison service.

Small-scale coal mines are found in almost every one of the 32 provinces, regions and municipalities of China,

and their collective output, individual capacity and workforce are highly variable. The percentage of provincial coal output derived from TVCMs within a single province varies from 20% to 80% [6]. The average output of these coal mines varies from as much as 25,000 tonnes per year in major coal mining provinces, to as little as 4,000 tonnes per year in provinces with fewer operations. The largest township mines have a capacity in excess of 100,000 tonnes per year. At the other end of the spectrum lies thousands of artisanal mines with outputs of a few hundred tonnes per year.

The TVCMs were overtly encouraged by all levels of government from the early 1980s when China faced a crisis of energy supply [18]. Laws and regulations, such as they were, were ignored and flouted in the interest of economic growth. Even new laws and regulations drafted in the 1980s and 1990s to cover safety, environmental protection and licensing were not implemented widely in the small-scale coal mining sector until the late 1990s.

In addition to providing much-needed energy, small-scale coal mines provided a basis for local employment and development in many poor and remote areas of China. Possibly as many as four million people were employed in the sector at the time of peak production. Other benefits from the growth and geographical spread of the TVCMs included the following [19]:

- The exploitation of small, complex, remnant or otherwise economically-marginal coal deposits that were of no interest to the state-owned mining companies.
- A diminished need for coal transportation, as coal was now exploited closer to the centres of demand.
- The substitution of coal for firewood reduced the destruction of forests in areas where coal had not been available previously.
- TVCMs provided economic competition to the larger state-owned coal mines.

Although the size of some of China's township and village coal mines exceed most people's definition of a "small-scale mine" [8,20–23], these operations suffer from many of the same problems as conventional small mines: large numbers of illegal operations; irrational locations; low recovery rates; poor safety; and substantial environmental damage [15,18,24–29]. Of these negative attributes, it is arguably the environmental effects that are likely to have the most widespread and long lasting repercussions. Specific impacts relating to the environment include:

- Destruction of arable and grazing land through:
- Accelerated erosion of topsoils;
- 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 local water tables leading either to flooding of land or to a shortage of water.

From the early 1980s to the mid-1990s, the central government's attitude towards TVCMs may be characterised as encouraging, yet ineffective. Production grew at a prodigious rate but legal, technical, environmental, and safety requirements seemed to be ignored in most mining areas. Short-lived and half-hearted rectification campaigns failed to make any significant impact on the behaviour of miners or local governments.

From late 1997 to 1998 there was a sudden drop in demand for energy in China, and the coal industry was affected more than other energy industries. This fall in demand for energy—especially for coal—is best explained by a general economic slowdown resulting from the Asian crisis, a decline in output from energy-intensive industries, closures of inefficient state factories and a general increase in end-use efficiency, as well as some substitution for coal by gas [17]. Stockpiles of coal grew to hundreds of millions of tonnes and prices in the domestic market plummeted [17,18,30]. In early 1998, production from some state-owned mines was suspended for two months in order to ease the oversupply problem. By the middle of the year, it became clear that this was not a temporary phenomenon; drastic action was needed to protect the interests of state-owned mines into which large amounts of state investment had been poured.

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 million tonnes per year. It was reported that 33,000 mines had been closed by the end of 1999, reducing annual output by 300 million tonnes [31]. By late 2001 the total number of TVCMs had reportedly been reduced to 23,000, resulting in a reduction in annual production from 620 million tonnes in 1997 to 200 million tonnes [32]. As well as TVCMs, a number of larger mines (near exhaustion) have been closed and some enterprises made bankrupt.

The level of local government responsible for the implementation of the closure campaign was the county. The county governments have faced a conflict of interests. 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 closure and production abatement is significantly less than that reported. Official figures show a sharp divergence from 1998 between rapidly declining coal production and only modestly declining coal consumption [17]. The magni-

tude of this divergence suggests that coal supplies were drawn from unreported coal production, presumably from TVCMs, as well as from the large stockpiles [33].

Investigations by central government revealed that the number of illegal coal mining operations had grown sharply, as had the number of related deaths and injuries [34]. As a result, the central government issued a circular on June 13th 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 [35].

In November 2001, five coal mine explosions occurred over a span of one week in Shanxi Province; the death toll was nearly one hundred [36]. All small coal mines in the province were ordered to stop production [32] and the Ministry of Land and Resources issued “Instructions for Further Strengthening the Order in Mineral Resources Operations”.

2.2. Quantifying the environmental impact

Specific information on the contribution of TVCMs to environmental damage at a national scale is difficult to obtain, and the environmental impact of TVCMs has to be inferred indirectly from Chinese government statistics. A recent report published by the World Bank [37] presents data that suggests that TVCMs have had a significant environmental impact at the national level, especially in the form of solid waste.

Township and village industrial enterprises (TVIEs) accounted for a substantial proportion of China's industrial output during the 1990s with some seven million enterprises employing seventy million people and contributing more than 50% of China's total industrial output value (Table 1). Non-metallic mineral enterprises formed the largest single sector within TVIEs in terms of both number of enterprises and gross industrial output

Table 1
Basic economic data for all TVIEs and for non-metallic mineral TVIEs, in the years 1989, 1995 and 1998. GIOV=gross industrial output value [37]

	Units	1989	1995	1998
Economic data for TVIEs				
Number of TVIEs	Thousand	7,364	7,180	6,619
GIOV	Billion Yuan	614	1,080	6,923
Proportion of total GIOV	%	24	56	58
Employees	million	56.24	75.65	73.34
Non-metallic mineral TVIEs				
Proportion of TVIE GIOV	%	14.5	11.45	10.21
Number of enterprises		193,722	176,372	116,292

Table 2

Different types of pollution from TVIE mining activity in 1995 showing ranking compared to other TVIE activities, percentage of all TVIE pollution, and total quantity of pollution (mmt=million tonnes; mt=thousand tonnes) [37]

Pollutant	TVIE activity	Rank	Percent	Quantity
Waste water SO ₂	Mining	2nd	12.3	727 mmt
	Non-metal mineral production	1st	50.3	2,249 mt
Soot	Non-metal mineral production	1st	64.4	5,466 mt
Industrial dust	Non-metal mineral production	1st	76.7	10,133 mt
Solid waste discharged	Coal mining and processing	1st	42.2	74 mmt

value (GIOV), and this category includes cement, brick-making and ceramics, as well as coal production and processing.

The information summarised in Table 2 indicates that coal-producing TVIEs are the leading dischargers of solid waste and that township and village mines in general are major contributors to waste water disposal. Further, the cement, brick making, tile and ceramic plants at the township and village level, many of which are in all likelihood fuelled by poor quality coal from TVCMs, constitute a major group of atmospheric polluters. A disproportionate amount of all of these forms of pollution occurs in the poorer provinces of western and central China (Table 3). Some 60% 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 two of these provinces (Yunnan and Shanxi). It is highly probable that a significant amount of the solid waste pollution generated in these five provinces originates from TVCMs.

The total levels of pollution caused by TVIEs increased dramatically during the early 1990s, as did the proportional contribution of TVIEs to total industrial

Table 3

The relative contributions of TVIEs from different regions of China to total TVIE pollution of different types. GIOV=gross industrial output value [37]

		West	Central	East
GIOV	%	8	18	74
Waste water	%	15	30	55
SO ₂	%	22	56	22
Soot	%	19	40	41
Industrial dust	%	14	29	57
Solid waste discharged	%	46	39	15

pollution (Table 4). This was at a time when the contribution of TVIEs to total industrial output was rising rapidly (Table 1). The period 1995–1998 saw the start of a systematic crackdown on small, highly polluting plants at the township and village level, and the result was a significant reduction in most pollutants discharged from TVIEs. Of these, the decline of solid waste discharge and, possibly, of wastewater, can be attributed to the closure of TVCMs.

A study on the impact of coal mines in Shanxi Province, which accounts for some 25% of China's total coal output, revealed the following [29]:

- 13% of the total land area of the province is affected by coal mining; that is, some 20,000 square kilometres out of 156,000 square kilometres.
- 650 square kilometres of land is subject to subsidence.
- More than 200 square kilometres of land is occupied by coal refuse tips totalling more than 270 million tonnes in weight.
- Within a selected study area, more than 20,000 square kilometres of land required rehabilitation as a result of coal mining.

These presumably rough figures illustrate the scale of the rehabilitation problem in Shanxi Province alone. In 1995, the number of TVCMs in Shanxi exceeded 6,000, and their collective output of 150 million tonnes accounted for some 45% of the coal produced in the province that year. Therefore, it is likely that the TVCMs account for a substantial proportion of this land damage.

2.3. Evaluation

China's township and village coal mines have fulfilled important economic needs: they have helped to enhance energy supply at both the national and local levels, and have served as a stimulus for local employment and development. Despite the evident short-term positive

Table 4

Pollutant data from all TVIEs in the years 1989, 1995 and 1998, showing total pollution levels (mmt=million tonnes) and as a proportion of all industrial pollution in China [37]

Pollution from all TVIEs				
Waste water	mmt	2,700	5,900	2,900
	%	10	21	15
SO ₂	mmt	3.6	4.4	3.8
	%	n.a	24	24
Soot	mmt	6.4	8.5	5.0
	%	n.a	50	42
Industrial dust	mmt	4.7	13.3	8.2
	%	36	67	62
Solid waste discharged	mmt	77	179	50
	%	69	89	71

impact of the TVCM sector, this mining activity has imposed a range of negative externality costs on the country. Arguably, the greatest and most pervasive of these has been environmental damage, though the direct human cost in terms of fatalities and health amongst the miners themselves has also been substantial. Governmental management of the TVCMs over the past twenty years has been largely ineffective, and only concerted campaigns have produced any measurable improvement, for example in the late 1990s.

The following two sections of this paper examine China's system of laws and regulations, and its institutional structure in an attempt to illustrate how weaknesses in the regulatory framework overall have contributed to the government's failure to bring order to the small-scale coal mining sector.

3. Laws and regulations

The last twenty years have seen an explosion in the number of laws, regulations and subordinate administrative measures implemented in China. The main aim of this section is to present and evaluate briefly the range of laws and regulations relevant to small-scale coal mining. In order for this account to be useful, it is first necessary to review the nature of the process by which Chinese laws and regulations are drafted, adopted and implemented.

3.1. The development and implementation of laws and regulations

Formally, a simple hierarchy of laws and law-making institutions exists in China [38]:

- The National People's Congress (the equivalent of a parliament or legislature) holds the power to make national laws.
- The State Council (the equivalent of a cabinet) can draft implementing rules, regulations, decrees and orders.
- Subordinate Commissions and Ministries can issue orders, directives and regulations, which are consistent with laws and with State Council regulations.
- People's Congresses at the Provincial and City levels may adopt local regulations.

In reality, it is the State Council that holds the real power in the development of laws and regulations, and receives substantial input from relevant Commissions and Ministries, especially in the economic sector [39]. Economic laws usually emerge from either the State Council or from a relevant Commission or Ministry. The State Council usually retains control of drafting and the review process before a law is sent to the National

People's Congress for approval. If the law is not approved, it is usually returned to the State Council for redrafting. Once approved, either the State Council or the relevant department of government is charged with devising and implementing regulations and measures. Local government may then draft separately additional regulations.

The nature of this law-making process reflects, in part, the view of the Chinese government that law is an instrument of policy and of control. Little emphasis is placed on protecting voluntary economic agreements or on controlling the power of the state [38,40,41]. The agencies responsible for policy in a particular sector of the economy are also responsible for the drafting of relevant laws and regulations for that sector. The role of the National People's Congress in the drafting and consultation process, though growing, is still marginal.

This process results in a body of law rife with inconsistency, conflict and ambiguity [38,41]. The inconsistency and conflict between the various legal documents results from contrasting interests of the different sponsors of the legislation; from the relative impotence of the National People's Congress; and from the failure of the Legislative Bureau of the State Council to strive for consistency. The ambiguity in most laws probably reflects, on the one hand, the need to achieve compromise between competing agencies and, on the other hand, the power which ambiguity grants to bureaucrats at the stage of implementation.

The implementation of laws and regulations runs into a further series of obstacles. These include a shortage of trained lawyers [42] and the difficulty of enforcing the judgements of courts [43]. The key factor relevant to this paper is the power of government agencies. The State Council, the Commissions and the Ministries not only have the authority to write the administrative rules and regulations, but have also been granted the power to enforce them [38]. Courts have yet to gain significant authority and independence, and are generally subordinate to the Communist Party, the government, and to a range of non-state actors at both the national and local levels [44,45]. The impotence of the courts, combined with the ambiguity of laws, leads to a complete lack of predictability in the legal process.

3.2. Laws and regulations related to TVCMs

A substantial body of law related directly and indirectly to TVCMs now exists in China. These may be grouped under the following four headings:¹

¹ The tables of laws and regulations are intended to be illustrative, and cannot be considered to be complete or definitive.

Table 5

Laws, regulations and measures relating to the rights to the mineral resources

Name of instrument	Year
Mineral Resources Law, amended	1986, 1996
Rules for the Implementation of the Mineral Resources Law	1994
Regulations for Registering to Explore for Mineral Resources Using the Block System	1998
Regulations for Registering to Mine Mineral Resources	1998
Regulations for Transferring Exploration Rights and Mining Rights	1998

Table 6

Selected relevant laws, regulations and measures relating to the operation of township and village coal mines, including safety

Name of instrument	Year
Law on the Coal Industry	1996
Administrative Measures for Coal Production Licences	1994
Implementation Rules for the Management of Coal Production Licences	1995
Regulations for Coal Businesses and Operations	1996
Law on Safety in Mines	1992
Regulations for Coal Safety Supervision	2000

- The regulation of rights to the mineral resources (Table 5).
- The regulation of coal mine operations, including safety (Table 6).
- The regulation of environmental protection and land management (Table 7).

Table 7

Selected relevant laws, regulations and measures relating to environmental protection

Name of instrument	Year
Law on Water	1988
Law on Environmental Protection	1989
Temporary measures for the Management of Environmental Protection in the Coal Industry	1994
Law on Water and Soil Conservation	1991
Law on Prevention and Control of Water Pollution, revised	1996
Law on Land Administration, amended	1986, 1998
Implementation Provisions for Law on Land Administration	1998
Regulations on Land Reclamation	1988
Implementation Measures for Regulations on Land Reclamation	1998

- The regulation of township and village coal mines (Table 8).

A Mineral Resources Law was first passed in 1986, with implementing rules appearing eight years later. The Law was revised in 1996 and a package of regulations was issued in 1998 (Table 5). For the first time in its history, China had a systematic set of rules concerning mineral exploration and production rights, and the transfer of these rights. In all likelihood, these regulations were promoted by the former Ministry of Geology and Mineral Resources. This Ministry was restructured in 1998 into the Ministry of Land and Resources, which now has the responsibility of implementing these rules, and for issuing exploration and mining licenses [46].

The second category of laws and regulations are directed at the operations of coal mines, and cover everything from development and production plans, to safety and marketing (Table 6). During the period 1994–1996, a number of measures were implemented for the coal industry as a whole. Specific rules to manage coal production licenses were issued in 1994 and 1995. These were soon followed by a Coal Law, which sought to establish a new framework for production. The Ministry of Coal Industries was the sponsor of these documents. It, along with the subordinate coal bureaux at the various levels of local government, was responsible for implementation, including the issuing of coal production licenses.

The Ministry for Coal Industries was abolished in 1998, and a limited range of functions was allocated to the newly-created State Administration for Coal Industries [46]. One of the key functions of this new department was to raise the standard of safety in China's coal mines, and it pushed through the Regulations for Coal Safety Supervision in the year 2000. A further reorganisation in 2001 abolished the State Administration for Coal

Table 8

Selected relevant laws, regulations and measures relating to the operation of township and village coal mines

Name of instrument	Year
Circular of the State Council on the Implementation of Industrial Management of Township and Village Enterprise Mines	1986
Administrative Measures for the Township and Village Enterprise Mines in Shanxi Province	1986
Measures for Reorganisation of the Township and Village Enterprise Mines in Shanxi Province	1986
Administrative Regulations for Township and Village Coal Mines	1994
Implementation measures for the Administrative Regulations for Township and Village Coal Mines	1994
Regulations for Small Coal Mine Safety	1996
Law on Township Enterprises	1996

Industries and replaced it with the Coal Safety Supervision Bureau.

The third category of laws and regulations relate to the protection of the environment and the management of the land. All but one of the measures listed in Table 7 have very wide application, but most make specific reference to, and all have application to the mining industry. Those relating to general environmental protection and specifically, to water and soil, fall under the remit of the State Environmental Protection Agency. Those relating to land administration and reclamation were promoted by the Ministry of Land and Resources.

The Temporary Measures for the Management of Environmental Protection in the Coal Industry of 1994 places significant responsibilities on the local coal mining bureaux for the administration of environmental protection in the coal mining sector, with the environmental protection agencies limited to an inspection role. This document emanated from the Ministry for Coal Industries.

The final set of regulations applies specifically to township and village mines, and not to large-scale, state-owned coal mines (Table 8). These measures fall into two time periods. From 1980 to 1986, the output of the TVCMs rose from 100 million tonnes to 300 million tonnes, their contribution to China's total coal output increasing from one-sixth to one-third [47]. Belatedly, the State Council issued a Circular in 1986, which sought to bring order to a chaotic regulatory situation, whilst at the same time, calling for higher levels of production. The Circular called on all levels of government to improve the standard of regulation for TVCMs, and to draw up local administrative provisions to implement the new Mineral Resources Law and the Regulations on Mine Production Safety. The two measures listed in Table 8 from Shanxi Province are examples of the response of provincial governments. These address a wide range of issues such as engineering and safety standards, inspection procedures, the role of different levels of government, the responsibilities of mine managers, employee contracts, and the legal status of TVCMs. It can be reasonably assumed that all or most coal producing provinces drew up equivalent sets of regulations.

By the mid-1990s, output from TVCMs was two times that of 1986, accounting for nearly 50% of national production [47]. In response to the continued low standards of regulation, the Ministry of Coal Industries promulgated a set of administrative regulations and accompanying implementation measures for TVCMs (Table 8). These were issued at exactly the same time as the Administrative Measures for Coal Production Licences. The TVCM regulations cover not only production and safety concerns, but also the issue of where TVCMs may be permitted to operate. These were followed by specific regulations to cover safety.

3.3. Evaluation

China now has a substantial number of laws, regulations and administrative measures, which apply directly or indirectly to township and village coal mines. However, despite the well-intentioned efforts of the departments involved, this body of law suffers from the same weaknesses as Chinese law in general. Laws governing mineral resources, land management, environmental protection and coal mining operations have been developed and promoted by institutions with noticeably different agendas. This, combined with the ad-hoc nature of these regulatory initiatives, has led to both duplication and inconsistency.

The Ministry for Coal Industries and its successors have developed a number of measures relating specifically to TVCMs, but these have tended to focus on the particular concerns of the Ministry such as mine design and safety management. 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. Thus, any mine manager, or township or village authority seeking to understand the legal framework for TVCMs should, in principle, become familiar with all the body of law listed in Tables 5–8, as well as local subsidiary regulations.

4. The institutional framework for implementation

Any individual attempting to describe how Chinese government institutions are structured and operate faces two problems. The first relates to the ever-changing structure of government. Major government and industry reorganisations took place in 1993, 1998 and 2001. This account is based on our understanding of the institutional structure between 1994 and 2000. The second problem relates to what the departments at various levels of government actually do. The opaque, heterogeneous and ambiguous nature of government functions in China renders the precise identification of specific functions almost impossible for the outsider. This section of the paper draws heavily on the authors' interviews conducted in Beijing and in Shanxi Province in 1999.

4.1. The institutional structure

The structure of China's government has been characterised by Kenneth Lieberthal as a "matrix muddle" of vertical and horizontal lines of authority and reporting [48]. Three main vertical lines may be identified (Fig. 1). The first comprises the core of China's government. At the top is the State Council, which resembles a cabinet, and is nominally subordinate to the National People's Congress or legislature. The State Council is underpinned by two important commissions: the State

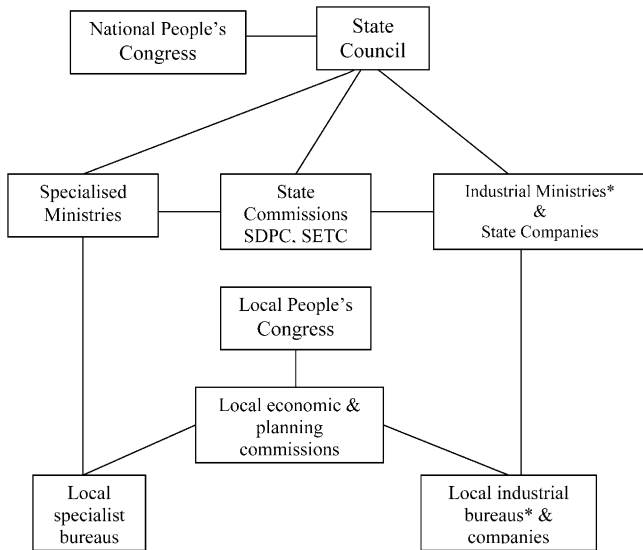


Fig. 1. Simplified scheme of the structure of Chinese government until 1998 for the industrial sector showing the relationship between the commissions, the industrial agencies and the specialist agencies at central and local government levels. This chart ignores the role of the Communist Party (based on [49]). * After the 1998 reforms, the government functions of the specialised ministries, state companies and bureaus were assigned to departments within the Economic and Trade Commissions at each level of government.

Development Planning Commission (SDPC), and the State Economic and Trade Commission (SETC). The People's Congress and Commissions are then replicated at all three lower levels of government: Province, City and County.

The industrial sector has traditionally been administered by two types of ministry. The industrial ministries (e.g. the Ministry of Coal Industries) owned and oversaw the running of the industries themselves. Most were converted to state corporations of ministry rank during the 1990s. The specialised ministries and agencies carried out cross-sector regulatory tasks such as the regulation of land-use or environmental protection. Thus, at any level of local government, an industrial enterprise would be subject to instructions from three types of agency, each with probably quite different objectives: the local government itself; the local relevant industrial bureau; and the local specialised bureaus.

The task of regulating TVCMs appears to fall principally to one industrial agency and two specialised agencies (Table 9), respectively responsible for the coal industry, land management and environmental regulation. As part of the 1998 reforms, the Ministry of Coal Industries was abolished, and some of its regulatory functions were passed to the State Administration for Coal Industries, which lay within the State Economic and Trade Commission [46]. At the time of our field studies in 1999, this reform at the central government level had not yet filtered down to lower levels. Therefore, the long standing Coal Administration Bureaus remained as relicts of

the Ministry of Coal Industries at provincial, city and county levels. The Ministry of Land and Resources arose from the merger of the Ministry of Geology and Mineral Resources and the Bureau of Land Administration. This last bureau had been previously located within the Ministry of Agriculture. Once again, in 1999, this reform had not filtered down to local government levels, and thus the Bureaus of Geology and Mineral Resources, and Land Administration existed at all levels of local government (Table 9). Finally, the State Environmental Protection Agency was also replicated at each level of government.

The lowest level of formal government lies at the County. But townships have many administrative offices that report to their respective County bureaux and which play a role in the implementation of policy formulated at higher levels. The manager of a TVCM is required to report to the four township offices belonging to the administrative lines just discussed—namely mining, land, coal administration and environmental protection. In addition, the TVCM manager is likely to be subject to ten or more other township offices, including safety, health, labour and finance (Table 9).

This multi-stranded matrix is further complicated by the overlapping nature of responsibilities. For example, the environmental regulation of TVCMs during the 1990s appears to have been subject to possibly four administrative lines (Table 10): the Environmental Protection Bureaus; the Environmental Protection Departments of the Coal Administration Bureaus; the Bureaus of Land Administration; and, at higher levels of government only, the Environmental Protection Commissions.

4.2. Regulatory functions

Among the main lines of administration applied to township and village coal mines (Table 9), five main regulatory themes stand out as of being of central importance to the government, mine owners and managers:

- The formulation and implementation of policy;
- the regulation of mining rights;
- the regulation of production and safety;
- the protection of the environment;
- the regulation of the market.

For most of these regulatory activities, the authority to formulate policies and issue licences is assigned to the provincial government. County governments are responsible for implementation, and the intermediate level of government plays a reporting and inspecting role. However, policies may be adapted to suit local conditions, and specific targets may be developed and assigned to different levels of government. The formulation of substantive policies at any level of government is almost certain to involve a number of different

Table 9

Simplified scheme showing generalised institutional structure for the main elements of regulation for TVCMs in 1999 (based on authors' interviews)

Central Government	State Environment Protection Agency	Ministry of Land and Resources	State Administration for Coal Industries
Provincial Government	Environmental Protection Bureau	Bureau of Geology and Mineral Resources, Bureau of Land Administration	Coal Administration Bureau
City Government	Environmental Protection Bureau	Bureau of Geology and Mineral Resources, Bureau of Land Administration	Coal Administration Bureau
County Government	Environmental Protection Bureau	Bureau of Geology and Mineral Resources, Bureau of Land Administration	Coal Administration Bureau
Township offices	Environment protection office Also: Safety, Water, Labour, Electricity, Health, Finance, TVE, Forestry, Electricity and other offices	Mining Office, Land Office	Coal Office

Table 10

Simplified scheme showing generalised institutional structure for the main elements of environmental regulation for TVCMs in the mid-late 1990s ([50,51], authors' interviews). *These commissions were abolished after the reforms of 1998

Central Government	State Council Commission on Environmental Protection*	State Environment Protection Agency	State Administration for Coal Industries	Ministry of Land and Resources
Provincial Government	Environmental Protection Commission*	Environmental Protection Bureau	Coal Administration Bureau, Environmental Protection Department	Bureau of Land Administration
City Government	Environmental Protection Commission*	Environmental Protection Bureau	Coal Administration Bureau, Environmental Protection Department	Bureau of Land Administration
County Government		Environmental Protection Bureau	Coal Administration Bureau, Environmental Protection Department	Bureau of Land Administration
Township offices		Environmental protection office	Coal Office	Land Office

government agencies, in particular, the local Planning Commission and the local Economic and Trade Commission.

Access to coal resources is governed by Mining Licences. These are formally issued by the Bureaux of Geology and Mineral Resources (now of Land and Resources) at the provincial level, although provincial governments can delegate this power to lower levels of government. The Bureaux at the County level carry out the detailed administrative tasks needed to assess individual applications, and also the necessary monitoring and inspection after the licence has been issued. Before the laws and regulations were issued in 1996 and 1998 (Table 5), all levels of government exercised the right to issue Mining Licences. This was a source of considerable confusion, as the geographical extent of these rights frequently overlapped.

The regulation of coal production and safety in TVCMs was the main responsibility of the local Bureaux for Coal Administration. The issuing of a coal production licence is dependent on the mine satisfying requirements relating to mine design and the efficient extraction of resources, as well as safety and environmental standards. Indeed, safety is supposedly one of the main criteria for the approval of a production licence. The local Bureaux for Coal Administration had Safety Departments that had a direct reporting line from the township level, through each level of government, to the province. These safety departments have presumably now been replaced by Coal Safety Supervision Bureaux at all levels of government. Production Licences are issued at the provincial level, but the County bureaux are responsible for approving annual production plans, and for carrying out safety inspections every few weeks.

In the past, the Ministry of Agriculture played an important role in the administration of TVCMs in those regions without a major coal-mining base. In the absence of local Bureaux of Coal Administration, the Ministry of Agriculture took on the role of supervising TVCMs through its local Bureaux of Township and Village Enterprises. This practice seemed to disappear at the end of the 1990s.

The Environmental Protection Bureaux and the Land Administration Bureaux are both supposed to play important roles in the regulation of environmental protection in TVCMs. Although there is undoubtedly considerable overlap between their spheres of activity, the former generally focuses more on water and air pollution, whereas the latter is explicitly responsible for land reclamation [29]. These Bureaux set environmental standards and carry out inspections, but the day-to-day administration of environmental matters was also shared with yet another set of institutions: the Coal Administration Bureaux (Table 10).

The local Environmental Protection Bureaux report upward to the State Environmental Protection Agency (SEPA), which was elevated to ministerial status in 1998. SEPA is responsible for developing national environmental policies, and for assisting in the drafting of environmental laws, regulations and standards [37,50,51]. It oversees the operations of Environmental Protection Bureaux at Provincial and lower levels, as well as of a hierarchy of Environmental Monitoring stations. The Provincial Environmental Protection Bureaux draw up local regulations and are responsible for enforcing and monitoring implementation at lower levels of government (Table 10).

Before 1998, a further type of environmental body was involved, the Environmental Protection Commissions. These were situated within the government at Central, Provincial and City levels. Their role was to coordinate the various environmental agencies at their respective levels of government. The commissions were abolished in 1998, as the enhanced status of the Environmental Protection Bureaux supposedly obviated the need for an additional coordinating body.

Finally, in a few provinces, such as Shanxi, each coal mine must obtain a marketing licence, which enables management to sell output legally. In Shanxi Province, these licences were issued by the Shanxi Provincial Coal Marketing Company. Each registered coal mine is issued a licence, along with an annual sales quota. When demand is low, this quota may be reduced mid-year. If demand is higher than expected, the mine may sell its excess, but only if the marketing company agrees and issues a marketing licence for the requisite amount of coal.

From this discussion, it is evident that TVCMs have been subject to a complex system of administration, which has placed a great burden both on the mine man-

agers and on the government. In principle, TVCMs should have at least two licences (mining, production and, in some places, marketing) issued by different agencies in order to be able to operate legally. In addition to having to satisfy the two agencies with environmental protection interests, mines are also required to meet the standards set by a large number of other agencies with offices at the township level (see Table 9). Further, a total of four levels of administration are involved from the township up to the province.

4.3. Evaluation

This administrative structure suffers from a number of weaknesses. First, the large number of levels of administration between the key level of policy formulation (the Province) and the township or village provides great scope for policy modification, inadequate implementation and direct obstruction. The modification of policy in itself may be beneficial, as long as it is carried out in a transparent way. Incomplete implementation may have a number of causes: a shortage of resources, a lack of will or of incentive, and deliberate obstruction. A shortage of manpower and funds appears to be a major obstacle to effective performance by all levels of government. A recent revamping of civil service personnel policies and incentives should be leading to the promotion of more highly motivated staff than before, but the massive cuts in staffing, which was part of the 1998 reforms, left many key departments grossly understaffed [46,52]. The potential for obstruction increases farther down the administrative ladder, because local governments in coal mining areas rely on income from TVCMS to finance their expenditure and to provide employment. In addition, the township and village governments are usually owners or part-owners of these mines [6] as well as having significant influence over local Environmental Protection Bureaux [52].

The second major weakness of the administrative system is the sheer number of vertical reporting lines, which converge downward on the hapless TVCM manager. The Bureaux for Coal Administration and for Land and Resources would seem to carry the brunt of the workload and responsibility for the effective regulation of TVCMs, but a number of other agencies have greater or lesser roles to play. This onerous reporting burden may lead to either one of two reactions from mine managers. The manager who is conscientious, well-trained and well-financed, may indeed seek to satisfy the requirements of all these agencies, but possibly at the cost of focusing on the most important functions of mining efficiently and safely. Alternatively, the less well-trained managers of smaller TVCMs are likely to avoid the entire regulatory web on account of it being too difficult to understand and too time consuming and costly to satisfy. On the government side, the large number of agencies is almost

certain to result in ambiguity, confusion and contradictions in the formulation and implementation of policy for TVCMs. No attempt seems to have been made to simplify the structure for the benefit of either the government or the miner.

The final major weakness relates to the overlap or duplication of roles amongst different agencies. This is a common feature of China's government and can be seen at the very highest levels of government [46]. The regulation of the environment provides the best illustration in the case of TVCMs (Table 10). The government reforms of 1998 did enhance the status of environmental protection in general and of SEPA in particular. Nothing was done to simplify the institutional structure, except for the abolition of the Environmental Protection Commissions at state, provincial and city levels. However, these commissions provided an important focus for collaborative work [52].

5. Conclusions

The sense of crisis that has overwhelmed China's small-scale coal mines since 1997 clearly shows that the system of regulation has been largely ineffective. The regulatory system for TVCMs has been characterised by an ever-growing weight of laws and regulations and a highly complicated administrative structure. The higher levels of government are prevented from achieving their policy goals by policy modification, inadequate implementation and direct obstruction at intermediate and lower levels of government. At the same time, small-scale miners receive little systematic help in their attempts to improve their practices and are discouraged from adhering to the rules by the weight and complexity of administrative process.

Such a regulatory system is typical for China, where interlocking and overlapping vertical and horizontal lines of authority permeate the entire structure of government [48]. However, it is in the energy and natural resources sectors that the negative impact of such administration is particularly pronounced [46,53].

China may be seen as an extreme example of a regulatory system that is poorly suited to the effective management of small-scale mines. It lacks simplicity and focus. Indeed, it is highly complex and diffuse. The major negative impacts from such ineffective regulation are wastage of coal resources, appalling safety standards and extensive environmental damage. The periodic campaigns to close mines and improve their standards have yielded little benefit to date, as many mines re-open soon after having been "closed".

A possible solution lies not in the wholesale reform of China's system of government, but rather in the creation of a specific agency to manage small-scale mines, or possibly just small-scale coal mines. This agency

would directly represent central or provincial government at township level, and would act as a "one-stop shop" for all regulation, administration and services for TVCMs. Such an initiative would require a strong commitment from government and substantial funding, as the case of Colombia has shown [12,13].

An alternative approach is to delegate the entire regulation of small-scale mines to county governments, but with the requirement that national laws, regulations and standards are followed. However, such a move is unlikely to lead to effective regulation of the TVCMs until progress is made on three fronts: the growth of participatory democracy at the local level; the development of the rule of law; and the separation of local government from local enterprises. Indeed, whatever approach is taken, the most urgent requirement is to remove the TVCMs from the clutches of local government so that conflict of interest can be reduced and transparency enhanced.

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References

- [1] Labonne B. Small- and medium-scale mining. The Harare seminar and guidelines. *Natural Resources Forum* 1994;18(1):13–6.
- [2] United Nations Secretary General. Recent mining developments in small-scale mining. *Natural Resources Forum* 1996;20(3):215–25.
- [3] Barry M, editor. Regularising informal mining. A summary of the Proceedings of the International Roundtable on Artisanal Mining. Washington D.C., May 17–19 1995, Industry and Energy Occasional Paper No. 6. Washington DC: World Bank, 1996.
- [4] International Labour Organization. Social and labour issues in small-scale mining. Geneva: International Labour Office, 1999.
- [5] World Bank. Consultative Group for Artisanal and Small-Scale Mining (CASM): Conclusions. Washington D.C., September 15–16 1999. Washington DC: World Bank, 1999.
- [6] Andrews-Speed P, Zamora A, Rogers CD, Shen L, Cao S, Yang M. A framework for policy formulation for small-scale mines: the case of coal in China. *Natural Resources Forum* 2002;26:43–52.
- [7] Davidson J. The transformation and successful development of small-scale mining enterprises in developing countries. *Natural Resources Forum* 1993;17:315–26.
- [8] Kumar R, Amaratunga D. Government policies towards small-scale mining. *Resources Policy* 1994;20(1):15–22.
- [9] Solomon MH. Small and mid-scale mining in South Africa: beyond the rhetoric. *Journal of Mineral Policy, Business and Environment* 1997;12(3):23–30.
- [10] Bugnosen E, Twigg J, Scott A. Small-scale mining legislation and regulatory frameworks. *Minerals and Energy* 1999;14(2):35–8.

- [11] United Nations Development Programme 1999. Artisanal mining for sustainable livelihoods. Artisanal—mining/. 1999.
- [12] Espinosa Bula D. Legalisation of small coal mines in Colombia. Centre for Energy, Petroleum and Mineral Law and Policy, Report No. CP2/2000. Dundee: University of Dundee, 2000.
- [13] Zamora A. International initiatives on small-scale mining: lessons from the Colombian coal experience. *Minerals and Energy* 2000;15(3):1–5.
- [14] Hollaway J. Lessons from Zimbabwe for best practice for small- and medium-scale mines. *Minerals and Energy* 2000;15(1):16–22.
- [15] Gunson AJ, Yue J. Artisanal Mining in the People's Republic of China. International Institute of Environment and Development, Draft Report, 2001.
- [16] Thomson E. Reforming China's coal industry. *The China Quarterly* 1996;147:726–50.
- [17] Sinton J, Fridley D. What goes up: Recent trends in China's energy consumption. *Energy Policy* 2000;28:671–87.
- [18] Wright T. Competition and complementarity: Township and village mines and the state sector in China's coal industry. *China Information* 2000;14(1):13–129.
- [19] Zhong Z. Small-scale mining problem in China—contributions, problems and policy options. Presented at Third Environmental Cooperation Workshop on Sustainable Development of Mining Activities. Cairns, Australia, 5–8 October 1999.
- [20] Carman JS. The contribution of small-scale mining to world mineral production. *Natural Resources Forum* 1985;9(2):119–24.
- [21] Alpan S. The role of government in promoting small-scale mining. *Natural Resources Forum* 1986;10(1):95–7.
- [22] Hollaway J. The small-scale mining sector in Africa; restructuring for profitability. *Natural Resources Forum* 1986;10(3):293–7.
- [23] Burke G. Policies for small-scale mining: the need for integration. *Journal of Mineral Policy, Business and Environment* 1997;12(3):11–4.
- [24] Sun ZQ, Zhang YR, He T, Yang CG. Expectancy of working life of mine workers in Hunan Province. *Public Health* 1997;111:81–3.
- [25] Ni W, Sze ND. Energy supply and development in China. In: McElroy MB, Nielsen CP, Lydon P, editors. *Energizing China. Reconciling environmental protection and economic growth*. Cambridge, MA: Harvard University Press; 1998. p. 67–117.
- [26] Carl Duisberg Gesellschaft e.V. Report on the International Round Table on Mining and the Environment. Berlin 22–26 November 1999.
- [27] Smil V. China's energy and resources uses: continuity and change. In: Edmonds R, editor. *Managing the Chinese environment*. Oxford: Oxford University Press; 2000. p. 211–27.
- [28] Horii N. Development of small-scale coal mines in market transition and its externality. In: Gu S, Horii N, editors. *Transformation of China's energy industries in market transition and its prospects*. China, Japan: Institute of Developing Economies; 2001.
- [29] Zhang H, Peng D. Investigations on ecological restoration and minesite land rehabilitation in Shanxi Province of China. In: Lu X, editor. *Mine reclamation and ecological restoration for the 21st century*. Beijing: China Coal Publishing House; 2000.
- [30] Coal Industry Advisory Board. Coal in the energy supply of China. Paris: International Energy Agency, 1999.
- [31] China Energy Efficiency Bulletin, June 2000, Vol. 6. No. 3.
- [32] China Energy Efficiency Bulletin, October/November 2001, Vol. 7. No. 3.
- [33] Sinton JE. Accuracy and reliability of China's energy statistics. *China Economic Review* 2002; to be published.
- [34] South China Morning Post, for 5th July, 2001.
- [35] BBC Monitoring Asia Pacific—Political, 18/6/2001.
- [36] South China Morning Post, for 17th November 2001 and 26th November 2001.
- [37] Nygrad J, Guo X. Environmental management of China's township and village industrial enterprises. Washington, DC: World Bank, 2001.
- [38] Chen J. Chinese law. Towards an understanding of Chinese law, its nature and development. The Hague: Kluwer Law International, 1999.
- [39] Scott Tanner M. How a bill becomes law in China: stages and processes in lawmaking. *The China Quarterly* 1995;141:39–64.
- [40] Lubman S. The future of Chinese law. *The China Quarterly* 1995;141:1–21.
- [41] Potter PB. Law reform and China's emerging market economy. In: Hudson C, editor. *The China Handbook*. Chicago: Fitzroy Dearborn; 1997.
- [42] Alford WP. Tasselled loafers for barefoot lawyers: transformation and tension in the world of Chinese legal workers. *The China Quarterly* 1995;141:22–38.
- [43] Clarke DC. The execution of civil judgements in China. *The China Quarterly* 1995;141:65–81.
- [44] Potter PB. Foreign investment law in the People's Republic of China: dilemmas of state control. *The China Quarterly* 1995;141:155–85.
- [45] Dicks AR. Compartmentalized law and judicial restraint: an inductive view of some jurisdictional barriers to reform. *The China Quarterly* 1995;141:82–109.
- [46] Andrews-Speed P, Dow S, Gao Z. An evaluation of the ongoing reforms to China's government and state sector: the case of the energy industry. *Journal of Contemporary China* 2000;9(23):5–20.
- [47] State Planning Commission. '97 Energy Report of China. Beijing: State Planning Commission, 1997.
- [48] Lieberthal K. *Governing China. From revolution through reform*. New York: W.W.Norton, 1995.
- [49] Lu Y. *Management decision-making in Chinese enterprises*. Basingstoke: Macmillan Press, 1996.
- [50] Jahiel ART. The organization of environmental protection in China. In: Edmonds R, editor. *Managing the Chinese Environment*. Oxford: Oxford University Press; 2000. p. 33–63.
- [51] Wang H, Liu B. Policymaking for environmental protection in China. In: McElroy MB, Nielsen CP, Lydon P, editors. *Energizing China. Reconciling environmental protection and economic growth*. Cambridge, MA: Harvard University Press; 1998. p. 371–403.
- [52] China. Air, land, and water. Environmental priorities for a new millennium. Washington DC: World Bank; 2001.
- [53] Andrews-Speed P, Dow S, Yang M. Regulating energy in federal transition economies: the case of China. In: MacKerron G, Pearson P, editors. *The international energy experience. Markets, regulation and environment*. London: Imperial College Press; 2000. p. 91–102.