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Cao, Y, Dallimer, M orcid.org/0000-0001-8120-3309, Stringer, LC
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Land expropriation compensation among multiple stakeholders in a mining area: explaining “skeleton house” compensation

Abstract: House demolition compensation in mining areas in China is determined by house size. This has led farmers to engage in “skeleton house” construction, namely, building simple structures that can increase the compensation obtained following land expropriation. While compensation standards and social security for land-expropriated farmers has received some research attention, investigations are yet to consider this challenge from different stakeholder perspectives. Clearly identifying the interests and interactive relationships of each group offers potential to deliver positive outcomes for all stakeholders and for the environment. This paper targets this gap using document analysis alongside semi-structured interviews with the Pingshou China Coal Corporation (PCCC), Pinglu District Government (PDG) and land-expropriated farmers in Shanxi Province in Northwest China, identifying reasons for and potential solutions to, the phenomenon of skeleton house construction. Novel application of the DPSIR (driving forces-pressures-statuses-impacts-responses) framework as a structuring tool for our analysis provides important insight into how the emerging situation has arisen and helps to identify potential countermeasures. There are many differences among the perspectives of the three stakeholder groups, and all are responsible for the phenomenon of skeleton houses. PCCC should follow different production routes to reduce their costs and the impacts on farmers. District Government should shift from a coping position (dealing with negative impacts from the coal industry) towards actively shaping coal industry development, thus reducing its negative impacts on wider society. Land-expropriated farmers should actively participate in meaningful discussions to assist PCCC and PDG to make reasonable and considerate compensation standards and social security policies.

Key words: Land use; Land expropriation; Rural settlement; DPSIR; Stakeholder; Social security; China

1 Introduction

Land expropriation has led to concerns about adverse impacts on populations whose lands are lost (Mahalingam and Vyas, 2011; Ty et al., 2013). While much research has focused on issues concerning compensation for land-expropriated people, few researchers have examined the perspectives of the different stakeholders involved in the land acquisition and compensation process. This paper addresses this gap through focus on land expropriated for mining by central government mining company in China.

What is considered adequate compensation for those who have their land expropriated differs markedly between countries, and between developed and developing countries. For instance, people in Bangladesh face severely diminished and highly uncertain livelihoods as a result of land expropriation (Feldman and Geisler, 2012). Pakistan adopts fixed rates of compensation in order to prevent speculation through which land-expropriated people acquire more land in order to get more compensation (Hull, 2008). The land acquisition process in India is neither consultative nor transparent, and compensation, resettlement and rehabilitation packages offered to former landowners are often outdated, inadequate or based on artificially low land values and are keenly contested (Mahalingam and Vyas, 2011). There is a big gap between policy and practice of compensation and resettlement policy in Vietnam (Dao, 2010), with procedures followed inadequately and little attention to due process. The law in Malaysia requires the state to pay adequate compensation, however, this is not defined (Alias and Daud, 2015). Together, these examples from Asia show a wide variety of contentious issues surrounding the reasonable payment of compensation.

Laws and policies are adhered to more strictly in the developed world. For example, in the United States, the market value of the subject property is generally held as just compensation for the dispossessed owner (Eaton, 1995; Sun, 2013). In the UK, compensation is based on the principle of value to the owner, comprising the market value together with other losses suffered by the claimant (Denver-Green, 1994; DCLG, 2010). Other developed countries follow the “land for land” compensation method, where, land is given to the land-losers so they can continue with previous agricultural activities (Chaudhry, 2011).

Current compensation practices in China differ from those in other countries because of the forms of land ownership and the political-economic structure (Zhang and Qiu, 2013; Sun, 2013). In China, the state (or local government) pays farmers a fee which takes four elements into account: (1) compensation for the land, (2) resettlement allowance for displaced people, (3) compensation for ground attachments, and (4) compensation for lost or un-harvested crops (Lin and Ho, 2005). A multiple output method has been adopted to calculate compensation, considering the value of the land's average output over the previous three years (Sun, 2013). The total compensation payable cannot be higher than 30 times the value of the land's average output over the previous three years (Tan et al., 2009).

When provided, compensation is usually monetary and generally considered insufficient (Bao and Peng, 2016). Income (to the local governments) from leasing land to developers is substantially more than the compensation for the expropriation, and the land-expropriated farmers do not benefit from this value gap (Du et al., 2016), partly because they lack the rights to challenge the amounts they receive (Hui et al., 2013).

The impact on the farmers themselves is multifaceted. Following the loss of their land, without the security provided through the ownership of cultivated land, land-expropriated farmers who are moved into cities both encounter financial difficulties and lack the same rights as other citizens who have a longer history of residence in an urban area. They are therefore marginalized in terms of employment opportunities and social security (Hui et al., 2013), with the literature suggesting that land-expropriated farmers are more likely to be surviving on low income and unemployed (Gan and Sun, 2015). Land-expropriated farmers become vulnerable because compensation standards do not match their losses and social security for their future livelihoods are inadequate (Sargeson, 2013). This causes discontentment among land-expropriated farmers, who resist using violence and appeals (Sargeson, 2013; Lian et al., 2016).

Moreover, in China, there is no set regulation for compensation related to the demolition of houses in rural areas (Table 1). Only some local governments pay this type of compensation, leading to confusion amongst both home owners and those liable to pay compensation (Lu, 2015). Although research has supported the idea of compensation standards being legally established (Lu, 2015; Liu, 2015), there remain major differences in the amounts of money actually paid, depending on interpretation of the policy by local government officials and whether houses are

being demolished on state-or collective-owned land (Liu, 2015). In China's urban areas, the house compensation value can be determined by the market price and assessed by authorized agencies according to The Legislation of House Expropriation and Compensation on State Owned Land (2011) (Table 1). In mining areas, which are mainly rural, compensation principles and standards are generally decided through negotiation between mining enterprises and farmers due to the absence of legislation or compensation standards (Li, 2014; Wang, 2016).

Comparing China with other countries (Table 1), similarities include, firstly, that legally constructed houses which were built before land expropriation became public knowledge, are compensated-this applies to skeleton houses too. Secondly, the compensation principles and standards in other countries are legislated at the national level, such as in Vietnam, the UK and the USA, and the house compensation value is determined by the market price or the equivalent reinstatement value. However, national-level legislation in China indicates that only houses on state-owned land can be compensated according to the market price. Although there are concrete and specific compensation principles and standards for house demolition and compensation on collective owned land in some cities, compensation principles and standards in most cities are still decided by discussion and negotiation between those demanding land and farmers (Wang, 2016).

Table 1 House demolition and compensation in China compared with that in other countries

Types	Laws and legislations	Levels	Compensation scales	Compensation principles and standards
House demolition and compensation on state owned land in China	The Legislation of House Expropriation and Compensation on State Owned Land (2011)	National	Legal and temporary houses are compensated, including house value compensation, moving and temporary relocation compensation, compensation for business and economic losses and lost profit. Houses constructed or expanded, or houses which changed use within one year of house expropriation becoming public, cannot be compensated.	Compensation value is based on the market price and cannot be lower than the market price of a similar house. Compensation value is assessed by authorized agencies.
House demolition and compensation on collective owned land in China	The Law of Land Administration of the People's Republic of China (2004)	National	No mention	Compensation standards for houses on expropriated land are determined by local governments.
	The Legislation of Implementation of The Law of Land Administration of the People's Republic of China in Shanxi Province (2008)	Province	Legal houses on the expropriated land can be compensated. Houses constructed on illegally occupied land cannot be compensated.	House value can be compensated with depreciation. Houses with equivalent area and identical quality can be given as compensation.
	The Legislation of Collective Owned Land Expropriation and House Demolition Compensation and Relocation in Hengyang	City	Legal houses can be compensated, including house structure compensation, house decoration compensation, moving and temporary relocation compensation, compensation for business and economic losses and lost profit. Houses constructed or expanded, or houses which changed use	Concrete and specific house structure compensation standards, decoration compensation standards, and moving and temporary relocation compensation standards. Monthly compensation for business and economic

	City, Hu'nan Province (2015)		within one year of house expropriation becoming public, cannot be compensated. House construction area exceeding 100 m ² per capita cannot be compensated.	losses and lost profit is 14% of the value of dismantled houses, and lasts 6 months.
House demolition and compensation in Vietnam	The Land Law (2003)	National	Houses built consistent with planning laws, and constructed before land expropriation became publically known can be compensated. Houses built before land expropriation became publically known, but which were built on land intended for other uses cannot be compensated.	Compensation value is based on the market price, or modified according to the market price.
House demolition and compensation in the UK	Land Compensation Acts (1973)	National	Houses are compensated together with the expropriated land. Houses must be legal and constructed before the land expropriation publicity. Compensation includes moving and temporary relocation compensation, compensation for business and economic losses and lost profit.	Compensation value is based on the market price. Compensation value may be assessed by considering the cost of providing an equivalent reinstatement of the houses if there is no general market.
House demolition and compensation in the USA	Federal Land Policy and Management Act (1976)	National	Houses are compensated together with the expropriated land and the houses must be legal and constructed before the land expropriation publicity. Compensation includes moving and temporary relocation compensation, compensation for business and economic losses and lost profit.	Just compensation value is determined by looking at the fair market value of the houses. Compensation value may be increased by some percentages of market value according to the owners' emotion. Compensation value may be assessed by considering the cost of providing an equivalent reinstatement of the houses if there is no general market.

Skeleton houses (the minimum infrastructure for a particular building to be considered eligible for compensation, developed as an explicit tactic to increase the amount of compensation that residents and land-expropriated farmers receive) are also subject to demolition and can receive compensation. Mining areas are characterized by large numbers of skeleton houses, especially coal mining areas managed by central government enterprises. Although skeleton houses also exist in public industries and urban construction industries, they are quickly dismantled with compensation. Table 1 indicates that one reason for such skeleton house construction may be related to the absence of laws and legislation, not least because there are known differences in how land expropriation in mining areas and house demolition for urban construction are managed (Table 2). Nevertheless, few studies have attempted to consider the interests and interactive relationships among multiple stakeholders (e.g. central government mining enterprises, local governments and land-expropriated farmers) and how these shape skeleton house construction. Existing research focuses largely on the interests of land-expropriated farmers, standards of land expropriation, and the social securities in place. This paper targets this gap using the DPSIR framework as an analytical tool, to investigate why skeleton house construction is taking place, identifying stakeholders' understandings of current trends in compensation, and how the problem could be addressed.

Table 2 Primary differences between local governments in land expropriation and house demolition

Aspects	Public industries and urban construction industries	Mining areas managed by central government enterprises
Status	Local governments dominate, which results in a monopoly of compulsory land expropriation. Land developers are largely subordinates or branches of local governments (Wu and Zhang, 2011).	Central government enterprises are not subordinate to local government. Conversely, local governments rely on the enterprises to boost economic development and supply mining land. Central government enterprises dominate land expropriation (Yin and Bai, 2015).
Benefit	Local governments can rely on land finance revenue in order to boost local economic development. Usually, rural land is expropriated and auctioned by local governments, and local governments can gain land grant capital as the main source of land finance revenue (Wu and Zhang, 2011; Ye,	Expropriation for mining land is granted by negotiation between enterprises and land-expropriated farmers. There is little land grant capital, and local governments can only gain some industrial land capitals, resource taxes and so on. Meanwhile, most benefits from coal mining are returned to the central

	2014).	government (Wang, 2016).
Effect	The local economy will grow and the urban environment will be improved. Land-expropriated farmers have better employment prospects and social security, all of which are sought by the local government (Zhao et al., 2014).	Although the local economy and employment can be improved by the resource industries, local governments have to bear enormous pressures from employment and social security of land-expropriated farmers and transformations to the economy. Problems are particularly severe after coal reserves become exhausted (Wang, 2015).

2 Methodology

2.1 Study area

Pinglu District, lies in the west of Shuozhou City, and Shuozhou City lies in the northwest of Shanxi Province, China in the semi-arid, warm temperate, continental monsoon climate zone (Table 3) and is a mixed mining-rural-settlement area (Cao and Bai, 2015). The area of Pinglu District is 2,314 km² and constitutes 21.6% of the Shuozhou City. The study area is a part of Pinglu District, and it includes Jingping Town, Xiangyangbao Township, Baitang Township, Yuling Township, Taocun Township and Xiamiangao Township. The majority (90%) of coal production in the area comes from three surface (Antaibao, Anjialing, Donglutian) and three underground (No.1, No.2, No.3) mines operated by Pingshuo China Coal Corporation (PCCC), with the remainder from smaller, local underground mines. The mined area accounts for 70% of the study area (517 km²). The study area offers a useful case as it faces land expropriation issues similar to those experienced in other regions of China in recent years.

Table 3 Physical characteristics of Pinglu District, Shanxi Province, China

Characteristics	Data
Annual average temperature	4.8 to 7.8°C
Annual rainfall	428.2 to 449.0 mm
Terrain altitude	1300 to 1400 m
Coal production	120 million tons
Farmland	42 000 ha
Construction land	4 000 ha

^①Destruction land includes any degraded land cover, such as excavated sites, subsidised land and contaminated land (MLR, 2013).

2.2 DPSIR model

The DPSIR (Driving forces, Pressures, Statuses, Impacts and Responses) framework is a conceptual model for understanding complex interactions between human and environmental systems (Svarstad et al., 2008). Increasingly, researchers use the framework in environmental management, to assess and monitor environmental trends (Zhou et al., 2015). DPSIR's focus on linkages encourages trans-disciplinary research, connects policy makers and stakeholders, and allows the framework to act as a heuristic tool for complex systems analysis. However, it has been critiqued for encompassing biophysical factors or socio-cultural dimensions rather than fully integrating both types of information. Further, it cannot quantitatively consider the dynamics of the system it models, handle cause-consequence relationships, suggests linear unidirectional causal chains, and ignores key non-human drivers of environmental change (Rekolainen et al., 2003; Lewison et al., 2016). Despite these issues, it provides a useful framework for analysis in this research. We apply it in a novel situation not only to reveal the complex interactions between environmental impacts from coal mining and human dependency on the coal economy, but also to frame our analysis of the interests and interactive relationships among the multiple stakeholders in land expropriation and compensation. Such a novel application is justified because this research spans multiple disciplines including mining, ecology, environmental management and environmental social sciences and takes a systems approach, qualitatively analysing the interactions and relationships between stakeholders and the environment.

A general DPSIR model has a broad scope. It contains different types of information about the environmental and human system (Zhou et al., 2015). In this study, DPSIR is used as a structuring tool as follows:

- D (driving force) indicators reflect management policies and the human activities that affect the environment and society.
- P (pressure) indicators reflect the environmental and social stress exerted by human activities.

- S (status) indicators reflect the current physical, biological and chemical statuses of the environment and the developmental statuses of the society.
- I (impact) indicators reflect influences on the human social system due to status changes.
- R (responses) indicators reflect social responses to the human social system impacts.

In our study area, both environmental and human systems are severely disturbed by coal mining, with few obvious areas of agreement among the coal enterprises, local governments and land-expropriated farmers (Yin and Bai, 2015). For instance, land-expropriated farmers expand skeleton house construction or occupy land for their construction simply to obtain more compensation, which therefore acts against the interests of the coal enterprises. However, this phenomenon has largely been a result of policy drivers outside the control of the other main stakeholders. The result is a deterioration in both the environment and human systems. By analysing the driving forces, pressures, statuses, impacts we can reveal a more nuanced understanding of the processes at play, as well as the perspectives of different stakeholders, and develop ways forward to better control the issue.

2.3 Data collection

We used a mixed method approach to data collection, including semi-structured interviews, literature and document analysis (Table 4). Semi-structured interviews were conducted in May 2016 with three staff from PCCC responsible for land expropriation; three staff from Pinglu District Government responsible for land use management; and sixty land-expropriated farmers. Land-expropriated farmers were interviewed with focus on the main labourers and dominant family members, and included thirty-six land-expropriated farmers yet to be relocated. There were forty-six men and fourteen women interviewed, and thirty-four interviewees aged from twenty-five to fifty-five. Twenty-six interviewees were above the age of fifty-five. Questions asked are summarised in Appendix 1.

Table 4 Methodological approach, data types and information sources used to inform the development of the DPSIR model for land expropriation in Pinglu District, Shanxi Province, China. Questions are given in

Supplementary Material (Appendix 1)

Methods	Data and information themes
Semi-structured interviews (Staff of Pingshuo PCCC)	<ul style="list-style-type: none"> - Dust pollution compensation fees - Skeleton house compensation costs - Length of time before land compensation schemes are publicised that skeleton houses must be constructed - Water supply around mining area - Expropriated farmers struggles for more compensation - Methods for helping land-expropriated farmers
Semi-structured interviews (Staff of Pinglu District Government)	<ul style="list-style-type: none"> - Approaches taken to increase urbanisation rates and reduce income gaps - Residential urban land supply - Social security available for land-expropriated farmers - Attitudes towards skeleton houses
Semi-structured interviews (Land-expropriated farmers)	<ul style="list-style-type: none"> - Changes in compensation and relocation standards through time - Cost of skeleton house construction - Benefits gained from dismantling skeleton houses - Impacts of coal mining - Level of satisfaction with compensation and relocation standards - Importance and types of available social security
Literature and document analysis (References and statistical year books)	<ul style="list-style-type: none"> - Coal production, sale and income for PCCC (Cao and Bai, 2015; Cao et al., 2016) - When relocations occurred, which villages were moved and how many people were involved (Yin, 2013) - Economic situation in Pinglu District (Pinglu Statistics Yearbooks 1986, 1995, 2004, 2013) - Areas of land use types (Cao and Bai, 2015) - Mining land supply (Yin and Bai, 2015) - When coal reserves became/will become exhausted (Cao and Bai, 2015) - Land-expropriated farmers' ideas about after land expropriation (Yin and Bai, 2015) - Pension and unemployment benefits (Shuozhou News Website, 2014) - Cost and time of land expropriation (Yin and Bai, 2015)

Data were qualitatively and quantitatively analysed using the DPSIR framework as an organising tool, summarising key findings and assigning them to the relevant element of the framework. Traits and changes to the system over time were subjected to quantitative analysis. For example, trend analysis and ratio analysis were adopted to discover the dynamics of coal production, sale and income in PCCC and economic development in Pinglu District. Qualitative analysis was also used, e.g. increases in land expropriation costs were summarized from changes in compensation and relocation standards, and dust pollution compensation fees, and the pressures of Pinglu District Government were comprehensively analyzed from residential urban land supply data, information on social security available for land-expropriated farmers, and so on.

3 Results and discussions

3.1 DPSIR model construction

Semi-structured interviews were summarized, and the themes of responses of different stakeholders were tabulated according to the DPSIR framework categories (Table 5). Findings were triangulated and supplemented with information from the literature and documents and are

presented in relation to the DPSIR model (Table 6).

Table 5 Summary of answers given in semi-structured interviews with multiple stakeholder groups (PCCC: Pinghuo China Coal Corporation; PDG: Pinglu District Government; LEF: Land-expropriated farmer) in Pinglu District, Shanxi Province, China. Text in bold indicates how answers relate to the DPSIR framework, according to whether they can be considered a driving force, pressure, status, impact or response (QPCCS: Question for PCCC staff. QPDGS: Question for Pinglu District Government staff. QEF: Question for land-expropriated farmer) is given in Supplementary Material/Appendix 1.

Codes for respondents	Summary of answers
QPCCS1	<ul style="list-style-type: none"> ● Two difficulties were identified: 1) land-expropriated farmers were not satisfied the compensation standards and wanted to get more compensation, because they were increasingly aware of their own future needs for income and social security (LEF-Driving force); 2) no detailed and effective compensation standards were made by the government (LEF-Driving force, PDG-Response).
QPCCS2	<ul style="list-style-type: none"> ● Land compensation and resettlement compensation standards were decided by law, but there were no clear compensation standards for ground attachments (buildings, structures and other things fixed on the ground) and un-harvested crops (LEF-Driving force, PDG-Response). Thus, land-expropriated farmers commonly constructed skeleton houses covering large areas and planted saplings at high density several years in advance of land expropriation notices becoming public (LEF-Pressure). By doing this, farmers could more than double the amount of compensation received (LEF-Impact).
QPCCS3	<ul style="list-style-type: none"> ● The government cooperated to inform land expropriation time, procedures, compensation standards, and assisted with registration of the land area, house statuses and other ground attachments and harvested crops. Sometimes the government helped land-expropriated farmers to get more compensation (PDG-Impact).
QPCCS4	<ul style="list-style-type: none"> ● We paid dust pollution compensation fees and transported water from other places to the rural settlements around the surface mining area (PCCC-Impact).
QPCCS5	<ul style="list-style-type: none"> ● The government should control skeleton house construction, make clear compensation standards for ground attachments and unharvested crops, and construct better social security systems in order to lessen dependence on compensation payments. Government should also oversee the distribution of compensation payments (PDG-Response).
QPCCS6	<ul style="list-style-type: none"> ● Controlling production costs is an effective way to increase the economic benefits of coal mining. This will also be helpful as a way to facilitate agreements between the coal enterprises and land-expropriated farmers. Production costs can be controlled (while still ensuring production is economically viable) through approaches such as ecological production, circular production and transparent production (PCCC-Response).
QPDGS1	<ul style="list-style-type: none"> ● The development of Pinglu District depended on the coal industry, especially the PCCC (PDG-Driving force). The local government profited from industrial land capitals, resource taxes and so on. Most benefits of coal mining were turned over to the central government. Nevertheless, coal mining has helped the local government increase the urbanization rate, employment rate and improve living standards (PDG-Driving force). The local government

	<p>also worried about the income gap between land-expropriated farmers and urban people (PDG-Pressure), which increased the burden on local government (PDG-Impact). The local government must also consider urban land supply and social security provision for land-expropriated farmers (PDG-Status).</p>
QPDGS2	<ul style="list-style-type: none"> ● We have tried different compensation approaches, including the land use method, or changing land expropriation to land rent, but it was difficult to roll out widely. We have also researched other methods to reduce land expropriation costs (PDG-Response).
QPDGS3	<ul style="list-style-type: none"> ● We found lots of skeleton houses constructed around surface mining areas (LEF-Impact). It was unnecessary for farmers to get local government's permission if they built skeleton houses on farmers' original residence bases. If constructed skeleton houses occupied other land, they would get local government's permission. Local government couldn't limit the construction areas and styles as long as they constructed on the permitted residence bases (PDG-Impact).
QPDGS4	<ul style="list-style-type: none"> ● If the skeleton houses had been built before land expropriation notices were made public then the houses are legal. Any built after the publicity notices were built illegally and their owners did not receive compensation (PDG-Response).
QLEF1	<ul style="list-style-type: none"> ● Most farmers knew about coal mining activity, but were not aware of specific planning or land expropriation notices (PCCC-Response).
QLEF2	<ul style="list-style-type: none"> ● Impacts of surface coal mining included land destruction, house cracks because of blast vibrations, decreases in groundwater levels, and crop yield declines because of dust pollution (PCCC-Pressure, PCCC-Status, PCCC-Impact).
QLEF3:	<ul style="list-style-type: none"> ● More than 60% of farmers who had had their land expropriated were trying to relocate to other reclaimed land parcels, if that land was of high quality (PDG-Response). They were looking forward to reaching agreement and moving as soon as possible. Some were anxious about moving (LEF-Impact).
QLEF4:	<ul style="list-style-type: none"> ● All land-expropriated farmers need sufficient compensation, good employment and high quality housing (PCCC-Impact). The compensation standards for land and resettlement are following in table 7. The compensation standard of skeleton houses was 600 CNY per m² (PCCC-Impact). Land-expropriated farmers had the opportunity to discuss the compensation standards and social securities (LEF-Response).
QLEF5	<ul style="list-style-type: none"> ● Some land-expropriated farmers built skeleton houses using their savings, while some farmers borrowed money from others or from banks (LEF-Status). They did not take into account opportunity costs or risks. They also did not realise that their actions would increase the land expropriation cost and delay moving (LEF-Response).
QLEF6	<ul style="list-style-type: none"> ● Most land-expropriated farmers saved their money in banks and bought commercial houses in towns and cities. There were no other reliable ways to invest money open to them (PDG-Response). In contrast, a few began to gamble or spend money on luxury goods (LEF-Response).
QLEF7:	<ul style="list-style-type: none"> ● All land-expropriated farmers were satisfied with their living conditions after relocation, compared to their previous living conditions (LEF-Response). Some young people worried about their future, especially access to social security (PDG-Response).

Table 6 Driving forces, pressures, statuses and impacts from different stakeholders

Stakeholders	Driving forces (D)	Pressures (P)	Statuses (S)	Impacts (I)
PCCC	<ul style="list-style-type: none"> ● D₁: Expanding coal production capacity and increasing coal output to maximize economic benefits 	<ul style="list-style-type: none"> ● P₁: Destruction of land by mining activities ● P₂: Dust emission ● P₃: Blast vibration 	<ul style="list-style-type: none"> ● S₁: Increasing areas of land expropriated and destroyed ● S₂: Severe dust pollution ● S₃: Severe damage to housing ● S₄: Lower levels of groundwater ● S₅: Reduced crop yields 	<ul style="list-style-type: none"> ● I₁: Land near mining areas is unsuitable for living or farming; ● I₂: Rural settlements are moved or compensation is paid for environmental destruction ● I₃: Costs of coal production increase
Pinglu District Government	<ul style="list-style-type: none"> ● D₂: Promoting local economic development through the coal economy ● D₃: Meeting urbanization targets by relying on land-expropriated farmers relocating to towns and cities 	<ul style="list-style-type: none"> ● P₄: Coal resources transferring to coal enterprises ● P₅: Mining land supply ● P₆: Urban land, infrastructures and securities becoming scarce due to over-consumption 	<ul style="list-style-type: none"> ● S₆: Coal resources exhaustion accelerated due to over production ● S₇: Mining land supply increasing ● S₈: Increments of urban land supply for residing, health insurance premium, etc 	<ul style="list-style-type: none"> ● I₄: Burden on local government increasing due to land-expropriated farmers moving to towns and cities ● I₅: Government acquiescence in construction of massive skeleton houses by land-expropriated farmers for more compensation

Land-expropriated farmers	<ul style="list-style-type: none"> ● D4: Ambiguous compensation standards ● D5: Poor social security system 	<ul style="list-style-type: none"> ● P7: Expanding skeleton houses or occupying land in order to build skeleton houses 	<ul style="list-style-type: none"> ● S9: Lots of money and land used for constructing skeleton houses 	<ul style="list-style-type: none"> ● I6: Area of land receiving compensation due to the presence of housing rapidly increasing ● I7: Land expropriation costs increasing; ● I8: Slower rural settlement relocation rates
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3.2 Driving forces

The market is an important driver of coal production. Indeed, the fundamental purpose of coal enterprises is to supply the market with coal to maximise economic benefits (Zhang, 2014). In meeting this goal, several PCCC mines have met and exceeded their designed production capacity (Cao et al., 2017). Between 2002 and 2011, coal production increased to 110 million tons, commercial coal sales were 85 million tons and income increased to 347 million CNY (Fig.1). While coal production was stable after 2010, sales were increasing, but income decreased slightly because of declining coal prices (Cao and Bai, 2015) (Fig.2).

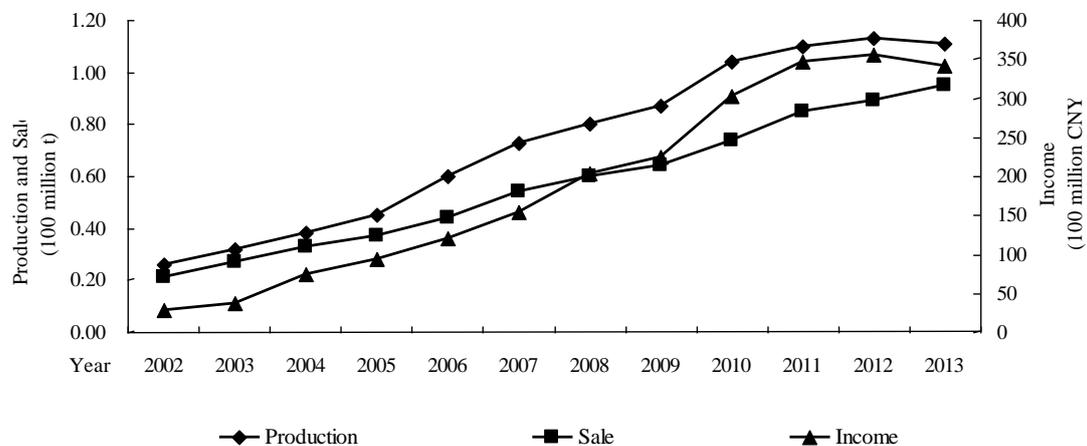


Fig. 1 Coal production, sale and income in PCCC

Pinglu District Government is dependent on the coal industry to meet its economic development targets. The Gross Domestic Product (GDP) of the district increased by 25.66 billion CNY from 1986 to 2013, especially after 2004 (Fig. 2). Although the Local Financial Income (LFI) gradually increased, the ratio between LFI and Total Financial Income (TFI) gradually decreased (Fig. 2). While both Income of Urban Residents Per Capita (IURPC) and Income of Rural Residents Per Capita (IRRPC) increased, the ratio between IURPC and IRRPC decreased (Fig. 3), indicating that the income gap gradually expanded. Representatives of Pinglu District Government reflected that it was the very important for local government to reduce the income gap when land-expropriated farmers moved to urban areas, otherwise it was likely that in the longer term, the costs for local governments would be higher.

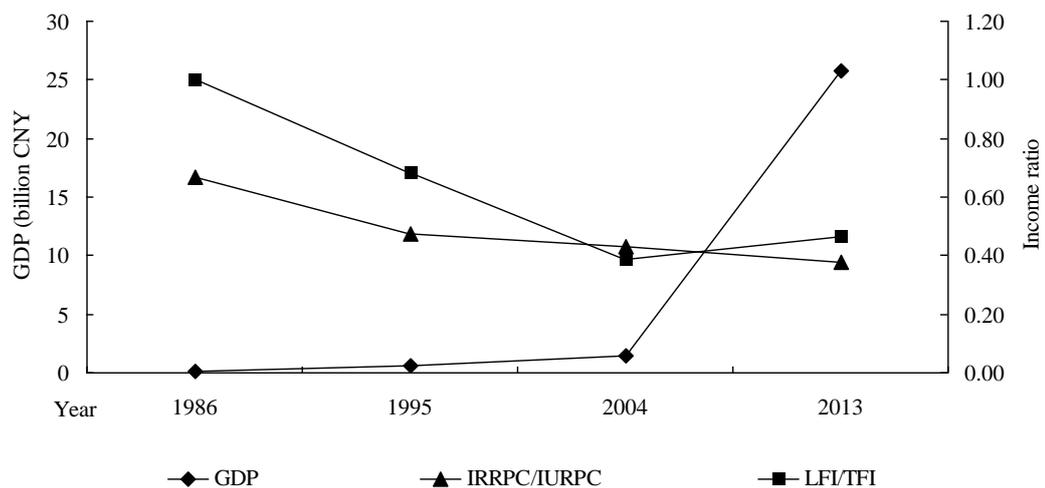


Fig. 2 Economic development in Pinglu District (Pinglu Statistics Yearbooks 1986, 1995, 2004, 2013). 1986: construction of Antaibao surface mine; 1995: primary production capacity of Antaibao surface mine; 2004: designed production capacity of Antaibao surface mine and Anjialing surface mine; 2013: over production capacity of Antaibao surface mine and Anjialing surface mine, and designed production capacity of Donglutian surface mine.

Urbanization rates in the research area were 16.25% in 1996, increasing to 45.88% in 2013 (PLSB, 1996; PLSB, 2013). The PCCC organized the relocation of land-expropriated farmers and now the majority live in towns and cities (Table 7). In 2012, The Pinglu District Government introduced a policy to increase the urbanization rate to 70% over the next few years (Cao and Bai, 2015). Government representatives reflected during interviews that the government encouraged land-expropriated farmers to move to urban areas in order to meet these targets.

Compensation covers the cost of the land, ground attachments, un-harvested crops and a fee for resettlement (The Law of Land Administration of the People's Republic of China, 2004). For land and resettlement costs, compensation was paid at the highest rates available within the regulations (Yin and Bai, 2015). There are no clear standards for the compensation fee for ground attachments or for un-harvested crops. However, although it is stipulated that construction and crop planting after the land expropriation notice becomes public are not eligible for compensation, many farmers constructed skeleton houses in the previous five to ten years. This indicates that ambiguities in the compensation standards give land-expropriated farmers the chance to receive more compensation (Zhu and Dong, 2015), albeit at their own risk. The higher compensation for those with skeleton houses is an important driver of their construction.

Land and housing represent farmers' source of income and security in China (Sargeson, 2013). Following relocation, farmers said their living conditions and incomes improved, but many (especially those between forty and fifty years old) feared the future once the coal had been exhausted. They therefore hoped to demand more compensation. The opinions of land-expropriated farmers varied: 30.22% wanted to enjoy their old age in peace, 34.53% expected to depend on their children, 25.90% hoped to continue to work, and 9.35% wanted to have their own business (Yin and Bai, 2015). The land-expropriated farmers said they demanded sufficient compensation capitals, good employment positions and satisfactory houses in order to meet their basic needs. In China, most land-expropriated farmers own no technologies, lack education, and rely on social security (Xiong, 2016).

3.3 Pressures

Pressures on the environment from mining include land destruction, dust emission and blast vibration, all of which increase as more coal production takes place. Increases in coal production (and the associated transfer of land and resources to the mining sector) are driven by the requirements of the local economy to meet economic and urbanisation targets, both of which are dependent on the coal industry in this region of China. As more land is given over to mining, more farmers have their land expropriated. The Pinglu District Government was concerned about the income gap between the land-expropriated farmers and urban residents. The land-expropriated farmers said they also have this concern, especially as they feel social security provision is

inadequate, and maximising their compensation rates to address this is the reason behind the construction of skeleton houses up to ten years before land is actually expropriated for mining.

3.4 Statuses

Overproduction in the coal mining sector has led to an accelerated rate of reserve exhaustion. Indeed, it is now thought that mines in PCCC will be closed within forty years; some forty years earlier than their designed lifespan (Cao and Bai, 2015). As coal was mined more rapidly, more land was needed to supply the industry, resulting in ever greater areas of land being expropriated from farmers. For instance, the annual supply of land for mining for Antaibao and Anjialing surface coal mines was <330 ha before 2010. This doubled (to 660 ha) with the opening of the Donglutian surface coal mine (Yin and Bai, 2015).

Land use types altered from cultivated land, woodland, grassland and rural settlements to coal mining land after expropriation. In the process of surface coal mining, the damaged land area increased from zero in 1986 to 6000 ha in 2013 (Cao et al., 2015). 10220 ha of cultivated land was destroyed by coal mining, mostly from 1986 to 2013, meanwhile other land uses saw losses too: woodland (2335 ha), grassland (4690 ha) and rural settlement (614 ha). The average damaged areas of cultivated land, woodland, grassland, rural settlement per 100 million tons of coal production were 1910 ha, 436 ha, 877 ha and 115 ha respectively.

Dust pollution from surface coal mining can be severe and stems from blasting, loading, transporting and dumping (Mandal et al., 2012). The impacts of dust pollution include reduced crop growth and yields. Dust covered crop leaves in the study area for a long time because of the dry, low rainfall climate. Expropriated farmers reflected that crops within 3 km of the surface mining area were polluted by the dust, and yields reduced by 50%. Houses within 2 km of the opencast area were damaged with severe deformation and cracks by the blast vibration. Expropriated farmers said they were worried about the damage to their houses, but despite having their land expropriated, often still did not know when they would be moved to new properties. The water system was also affected (Manna and Maiti, 2016). The confluence of ground water changed because of landform changes, obstructing stream flow and altering water availability in the lower parts of small catchment basins (Manna and Maiti, 2016). Furthermore, underground water levels dropped because inflow routes were disrupted by the open pit (Struzina et al., 2011). Expropriated

farmers said the quantity of water in rivers downstream from mines had reduced, and some of them had become permanently dry. Expropriated farmers said that they could get underground water with wells around 10 m deep prior to the start of mining, but that subsequently even wells 100 m deep were dry.

Representatives of Pinglu District Government reflected that they must consider the amount of urban land required for rehousing land-expropriated farmers alongside their needs for employment. For instance, there were three communities (total area 59 ha) where land-expropriated farmers could live (Cao and Bai, 2015). Around 30% of land-expropriated farmers were subsequently employed by PCCC, 34% of them worked locally, around 25% were looking for work and 11% were recuperating from illness at home (Yin and Bai, 2015). Pinglu District Government promised that all of the land-expropriated farmers (whether they worked or not) should receive social security. 15,588 land-expropriated farmers paid a small premium and joined the social security system in 2014. In addition, 2893 land-expropriated farmers have started to receive pensions (totalling 19 million CNY) or unemployment benefits (SNW, 2014).

Land-expropriated farmers focussed on how to attain more compensation. To do this they invested money, land and cultivated areas to construct skeleton houses. Their motivation is clearly seen from the compensation rates available to them. The land-expropriated farmers said cultivated land was compensated at 40 CNY m², but houses received 600 CNY m². Given it was possible to build a skeleton house for 300 CNY m² financial gains were substantial. Scaling up, compensation per ha of cultivated land was 300,000 CNY. Converting this into skeleton houses, which are typically two-storeys, results in 2 ha of house area, delivering a net income of 6 million CNY after expropriation, some 20 times more than if the land had been left as cultivated land. In order to build this housing, land-expropriated farmers said they borrowed money or obtained loans. There was 484.46 ha of cultivated land occupied by rural settlements between 1986 and 2013, some of them consisting of skeleton houses. In China, house construction is forbidden on cultivated land except when land use planning permission has been granted. Although planning permission may be given, the house construction should be approved for cultivated land transformation by the county (district) governments (The Law of Land Administration of the People's Republic of China, 2004). The highest rates of construction took place between 2000 and 2004, when 137.68 ha within 2 km around the stripped area of surface mines was built on (Cao and Bai, 2015).

3.5 Impacts

Living and farming within 3 km of the surface mining area was deemed impossible by expropriated farmers. Four periods of relocation took place between 1986 and 2013 (Table 7). There were obvious differences and inconsistent compensation standards associated with relocation.

In addition to expropriation costs, representatives of PCCC said that the enterprise pays an annual dust pollution compensation fee of 1720 CNY per capita to expropriated farmers who had not moved. Meanwhile, the enterprise must transport domestic water from other places to the coal mining area because of coal mining induced water scarcity. All of these factors increased the production costs of PCCC.

The enterprise hoped land-expropriated farmers would move as soon as possible. Representatives of PCCC reflected that expropriated farmers wanted more compensation and better relocation packages because of rising costs of living and increased awareness of social security. Interviewees said that farmers had expanded or constructed skeleton houses five to ten years earlier, so they existed before the land compensation notices were made public. As such, they were legally entitled to compensation, resulting in an increased cost of expropriation for the coal enterprise.

Table 7 Numbers of people relocated and villages moved during four phases of mining in Pingshou District, China. Information on the types of compensation paid was taken from interviews with land-expropriated farmers

Time period	Moved villages	Relocated people	Compensations
1985-1995	Antaibao, Cuijialing, Nansi, Dongsuanci, Yingziwa, Xisuanci	1900	<ul style="list-style-type: none"> ● Land compensation fee and un-harvested crop compensation fee were 3 CNY per m²; ● One worker in each family was given work in PCCC; ● Compensation fee for relocation was 8000 CNY per capita; ● Each family could get 2000 CNY to buy one relocation house of 150 m² (3000 CNY); ● Men above 60 years old and women above 50 years old could get monthly pension of 200 CNY per capita
1998-2002	Baixinyao, Shang yao, Maanshan	1500	<ul style="list-style-type: none"> ● Land compensation fee was 16 CNY per m²; ● Crop compensation fee was 7000 CNY per capita; ● Workers between 18-35 years old in each family were

			<p>employed by PCCC;</p> <ul style="list-style-type: none"> ● Compensation fee for relocation was 10000 CNY per capita; ● Each family can buy one relocation house of 160 m² in Qinyi Community in Jingping Town (80000 CNY); ● Residents under 18 years old could get a monthly living subsidy of 160 CNY per capita, residents between 18-22 years old could get a monthly unemployment subsidy of 360 CNY per capita, residents between 60-85 years old could get a monthly pension of 560 CNY per capita
2007-2010	Qian' anjialing, Houdong, Houxi, Baishiya, Yangquan	4900	<ul style="list-style-type: none"> ● Land compensation fee and un-harvested crop compensation fee were 31 CNY per m²; ● Those 18-35 years old in each family were arranged work in the PCCC; ● Compensation fee for relocation was 80000 CNY per family; ● Each family can buy a relocation apartment in Wenyuan Community in Jingping Town, and the price was 960 CNY per m² if the apartment area per capita was less than 30 m², otherwise, the price was 1260 CNY per m²; ● Residents under 18 years old could get a monthly living subsidy of 160 CNY per capita, residents between 18-22 years old could get a monthly unemployment subsidy of 360 CNY per capita, residents between 60-85 years old could get a monthly pension of 560 CNY per capita
2011-2013	Qiaoqian, (in Qiaohou, Nanwa, process at Zhuanjing, the time of Yuling, data Xuejiagang, collection) Louzigou	7400	<ul style="list-style-type: none"> ● Land compensation fee and un-harvested crop compensation fee were 37 CNY per m²; ● Compensation fee for relocation was under discussion; ● Each family can buy a relocation apartment in Shanxue Community in Jingping Town, and the price was under discussion; ● The house rental costs of moved farms in Jingping Town was paid by PCCC; ● Residents under 18 years old could get a monthly living subsidy of 160 CNY per capita, residents between 18-22 years old could get a monthly unemployment subsidy of 360 CNY per capita, residents between 60-85 years old could get a monthly pension of 560 CNY per capita

PCCC is a central government enterprise based in Pinglu District. The representatives of

Pinglu District Government said sometimes they lacked influence on decisions around land expropriation and could not decide the scale, timing or standards of compensation standards. Pinglu District Government and land-expropriated farmers both felt that the land-expropriated farmers should be entitled to greater access to social security payments (Yin and Bai, 2015). The representatives of PCCC said that Pinglu District Government helped the land-expropriated farmers to achieve higher levels of compensation through policy deregulation in rural housing sites and house extensions. Government representatives said that they knew the actions of land-expropriated farmers, but it was very difficult to manage and control the house construction areas and the styles. As a result, the cost of land expropriation increased as a greater area of land was taken up by housing. Representatives of PCCC said the house construction area requiring compensation also doubled due to skeleton house construction. Meanwhile, land-expropriated farmers felt they should receive even higher levels of compensation for the skeleton houses to cover the opportunity costs of the time, money and land. Thus, land expropriation costs increased, making it harder to reach agreements on compensation standards, especially when the demand for coal started to fall. This resulted in a delay in when expropriated farmers could actually relocate away from mines.

3.6 Responses

The driving forces, pressures, statuses and impacts of multiple stakeholders relating to skeleton houses construction have been analyzed in the previous sections. Responses are proposed here according to the elements under the driving forces, pressures, statuses and impacts categories (Fig. 3). Some responses directly relate to skeleton houses; others are indirectly related, meanwhile, the response processes of different stakeholders for skeleton house issues are demonstrated (Fig. 4, Fig. 5 and Fig. 6). The existence of and compensation for skeleton house demolition is not only related to the land expropriation institution; it also relates to the relationships between the stakeholders. For instance, skeleton house construction is a response undertaken by farmers who are dissatisfied with the compensation they receive for their loss of livelihood options. Most responses carried out by stakeholders are therefore, based on their own best interests and are not intended to solve or ameliorate the current compensation processes.

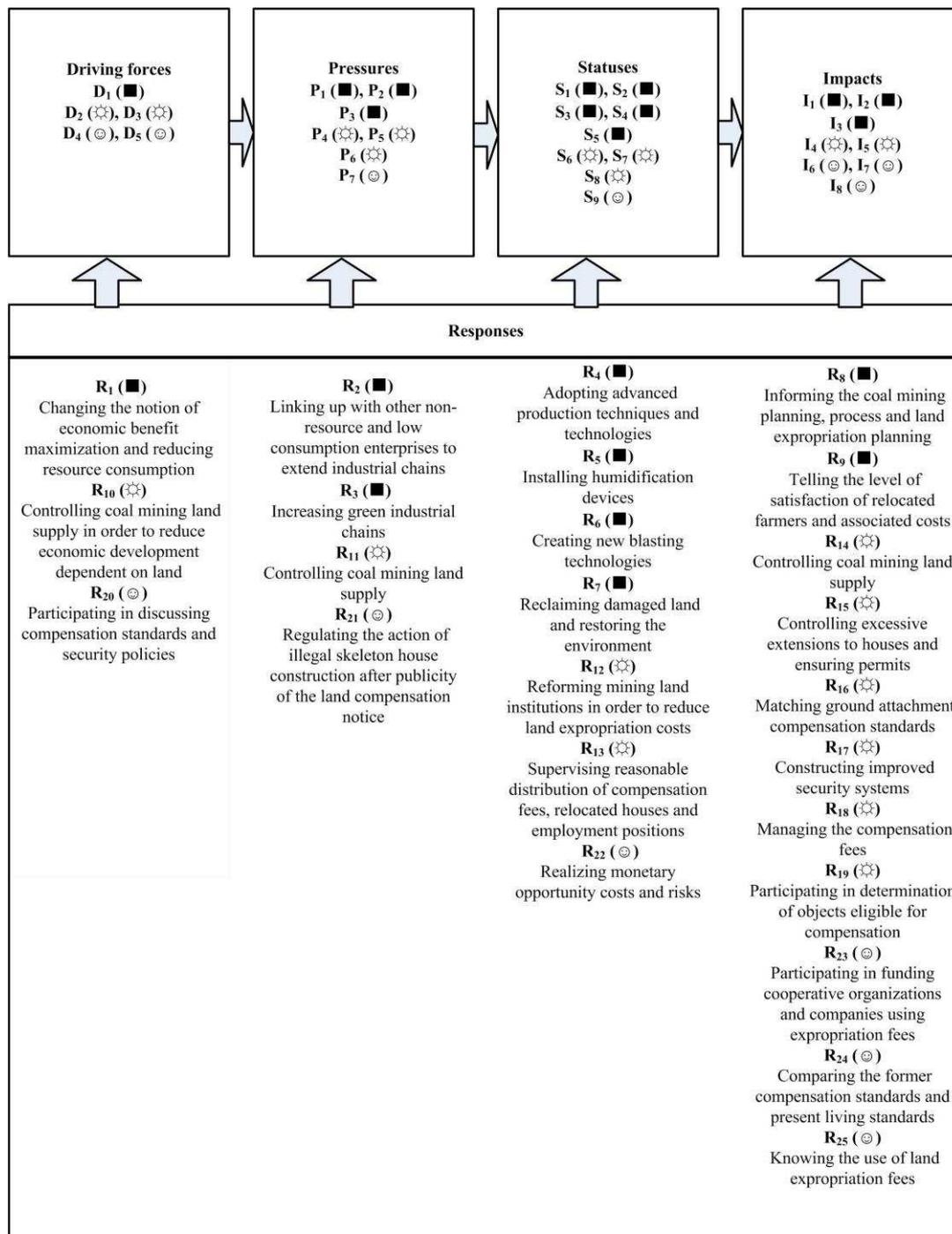


Fig. 3 Possible responses of the three stakeholder groups (■: PCCC, ☼: Pinglu District Government, ☉: Land-expropriated farmers) to the driving forces, pressures, statuses and impacts of the expanding coal mining

sector in Pinglu District, Shanxi Province, China.

(1) Responses of PCCC

PCCC should change the notion of economic benefit maximization and pursue a different

approach to production that takes into account land compensation and destruction. Doing this would likely decrease the cost of production and therefore improve profitability (Fig. 3 and Fig. 4) (Fan et al., 2015). It is thus essential that PCCC adopts advanced production techniques and technologies to reduce the environmental impacts from surface coal mining (Fig. 3 and Fig. 4). For example, methods of avoidance, containment, suppression, and collection were used in Australia to control dust emission (DECCW, 2010). Dust and weather monitoring equipment, air humidity devices and hopper trucks were used to reduce dust (DECCW, 2010; Liu et al., 2016), and new explosives can be adopted for reducing blasting impacts (Wang et al., 2016). Meanwhile, the ecological environment in the mining area can be improved by limiting exposed areas, accelerating damaged land reclamation and optimizing land reclamation quality (DECCW, 2010; Zhou and Zhou, 2013). Ecological production will increase the production cost, but it will reduce the environmental impacts from coal mining and the dust pollution compensation fee, and will be helpful for gaining capital and reaching agreements on skeleton house demolition and compensation.

In the process of relocation, PCCC needs to be responsible for the employment of land-expropriated farmers in order to reduce the relocation cost. It would be helpful for PCCC to link up with more non-resource, low consumption enterprises to extend industrial chains and increase green industrial chains, creating new jobs (Fig. 3 and Fig. 4). The coal industry relying on industrial chain extension creates jobs in industries that support coal mining, and by providing reliable and low cost electricity that stimulates growth across the entire economy, especially in manufacturing (NCC, 2015). Experiences from around the world support this. There were 25,000 new jobs provided after coal in Kentucky (US) dependent on new industrial chains related to energy efficiency, forest products tourism and environmental remediation (Ackerman and Comings, 2015). PCCC focuses on coal production, coal sale and electricity generation. Lots of jobs are associated with this industry, in coal mining, coal sale, coal transportation and electricity generation. Developing a cleaner coal chemical industry is an important method for extending coal industrial chains. Ecological agriculture and installation agriculture can be implemented on the reclaimed land, meanwhile, ecological tourism can be developed with the advantage of industrial landscape, restored area, ecological agriculture and installation agriculture. All of these are effective for creating new jobs. Coal enterprise and land-expropriated farmers can therefore

benefit from industrial chain extensions and increases, while improved economic development and employment rates will be welcomed by the local government and local residents. Importantly, land-expropriated farmers could profit from extending and increasing industrial chains because more job opportunities help the land-expropriated farmers to reduce their dependence on land expropriation and skeleton house compensation which will therefore also facilitate agreement on the issue of skeleton house demolition and compensation.

Land expropriation processes should be more transparent (Fig. 3 and Fig. 4). The land-expropriated farmers should be kept informed and PCCC should take into account that farmers would like to know how expropriation decisions are taken and the implications for them. Involving farmers in these processes is likely to increase satisfaction with land expropriation compensation. Thus, PCCC should keep farmers fully informed of plans for mines and subsequent land expropriation. Farmers should also be made aware of opportunities and benefits associated with relocation. Providing more complete information could reduce the incentive for farmers to rush to build skeleton houses (Fu, 2014; He and Asami, 2014). The land-expropriated farmers said they did not know the concrete coal mining plans and thought their skeleton houses would be dismantled and compensated at most, five years after construction. They failed to realize that their skeleton houses might not have been dismantled ten years later. Similarly, if farmers can fully participate in the land expropriation process, effective feedback (e.g. through hearings and meetings) should ensure that expropriation can proceed more efficiently for the farmers themselves (Hong, 2016). Increased transparency is likely to be welcomed by farmers and although the coal enterprise may not initially see many benefits from being more open about their plans, in the longer term they are likely to see a reduction in costs and fewer delays when they wish to expand operations.

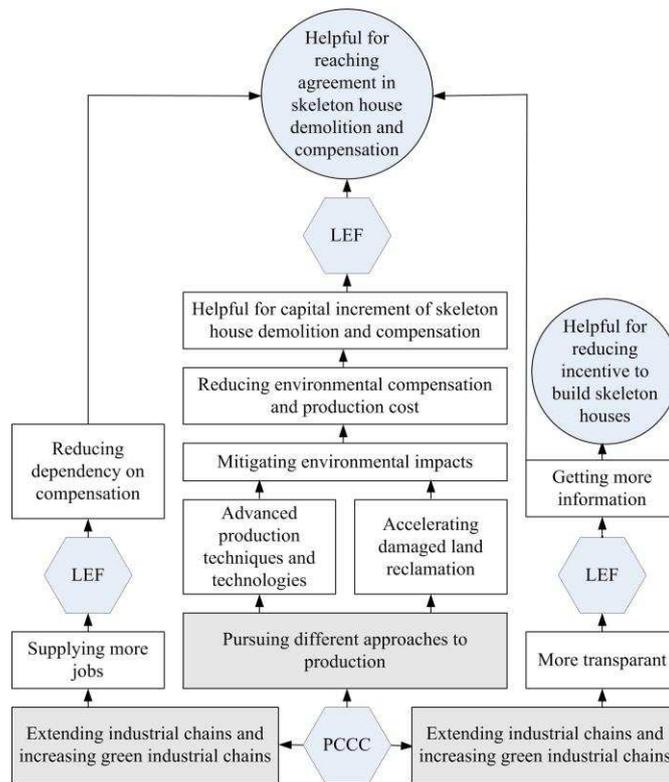


Fig. 4 Response process of PCCC to skeleton houses

(2) Responses of Pinglu District Government

Local governments should play an important role in land expropriation, especially in skeleton house management, not least because they put together land expropriation policies, approve land use management plans and protect the rights of farmers who have their land expropriated.

It is necessary to focus on the interests of PCCC, Pinglu District Government and land-expropriated farmers in the approval of land supplies (Fig. 3 and Fig. 5). The coal enterprises would like to increase the demand for land for mining in order to increase profits. The land-expropriated farmers want to receive higher levels of compensation (as demonstrated by the construction of skeleton houses). A strong land use management system is required to simultaneously address these issues. In Australia, state and local government strategic land use planning across coal rich regions was strictly abided by to create huge potential for sustained coal mining (Glowacz and Abnet, 2011). Thus, Pinglu District Government should supply coal mining land according to a land use plan, rather than via an ad hoc process. The representatives of Pinglu District Government said if the coal mining land is controlled, the speed of local economic development and urbanization of land-expropriated farmers will also be controlled. They also said they can strictly control house extensions in rural areas, dismantle skeleton houses and impose a

system of fines for illegal skeleton house construction. Although strengthening the role of the local government might impose constraints on the expansion of the coal sector, it will also reduce skeleton house construction, lower compensation payments for other land expropriation in the short term and concentrate capital for skeleton house demolition and compensation, and speed up the relocation of expropriated farmers.

There is no effective supervising mechanism for land expropriation in China (Li, 2015). The representatives of Pinglu District Government thought that establishing a land expropriation office to supervise land expropriation and compensation would be an effective mechanism (Fig. 4 and Fig. 6). This would (i) accelerate the implementation of land expropriation and skeleton demolition and reduce the time farmers must wait for compensation, and avoid skeleton house construction again because of delayed implementation; and (ii) ensure that any compensation is justified and reasonable. It is very important to let land-expropriated farmers know that their proper rights and social securities are protected by the government. Bao and Peng (2016) indicated that when land-expropriated farmers thought their rights and securities were protected, their uncertainty about the future decreases, and they no longer carry out other activities to increase compensation. Overall, it gives them encouragement to reach agreement in skeleton house demolition and compensation.

Pinglu District Government can also reform mining land institutions in order to reduce the land expropriation costs for PCCC (Fig. 3 and Fig. 5). The representatives of PCCC said that land expropriation costs were too high, and they hoped Pinglu District Government would reform mining land institutions. In other opencast mining areas, reforms have already been implemented. For example, land for an opencast area and dump site can be rented for five to ten years from the rural collective, and then returned to the rural collective after reclamation. The land for industrial sites can be expropriated and transferred to the enterprise for fifty years (Li, 2011). The cost of land rent is less than that of land expropriation (Kang and Liu, 2015). The reclaimed land is managed by PCCC, and there is no effective method for the enterprise to retire the reclaimed land management in order to reduce its cost. The representatives of PCCC also said Pinglu District Government should make policies to help the enterprise retire from the management of reclaimed land and encourage land-expropriated farmers to take it on. Thus, both the coal enterprise and the land-expropriated farmers will benefit from the reform of mining land institutions. It will help the

coal enterprise to decrease land use costs and give the opportunity to increase skeleton house demolition and compensation, meanwhile, it will help the land-expropriated farmers to reduce their dependency on compensation.

Pinglu District Government should actively participate in land expropriation compensation and relocation (Fig. 3 and Fig. 5). The government firstly should ensure that ground attachment (including skeleton houses) compensation standards meet The Law of Land Administration of the People's Republic of China (2004), and these standards must be considerate, feasible, quantitative and uncontested (Mei, 2007). The government secondly must develop an improved social security system for land-expropriated farmers in terms of employment, education, health and provision for their old age, and avoid them being marginalized on moving to towns and cities (Hui et al., 2013). The government thirdly should help land-expropriated farmers to manage the compensation capital and supply information and technology services to ensure their employment and future livelihoods (Bao and Peng, 2016). Finally, the government should participate in the land expropriation, especially cooperate with the enterprise in the identification, discussion and registration of legal compensating objects after the publicity of the land expropriation notice (Liu et al, 2016). The representatives of PCCC also said that the ground attachment compensation standards were helpful as they clearly implemented compensation for skeleton house demolition. Meanwhile, the land-expropriated farmers reflected that help from the government can reduce their worries about their future incomes. Thus, all of these will be helpful for reaching agreement in skeleton house demolition and compensation.

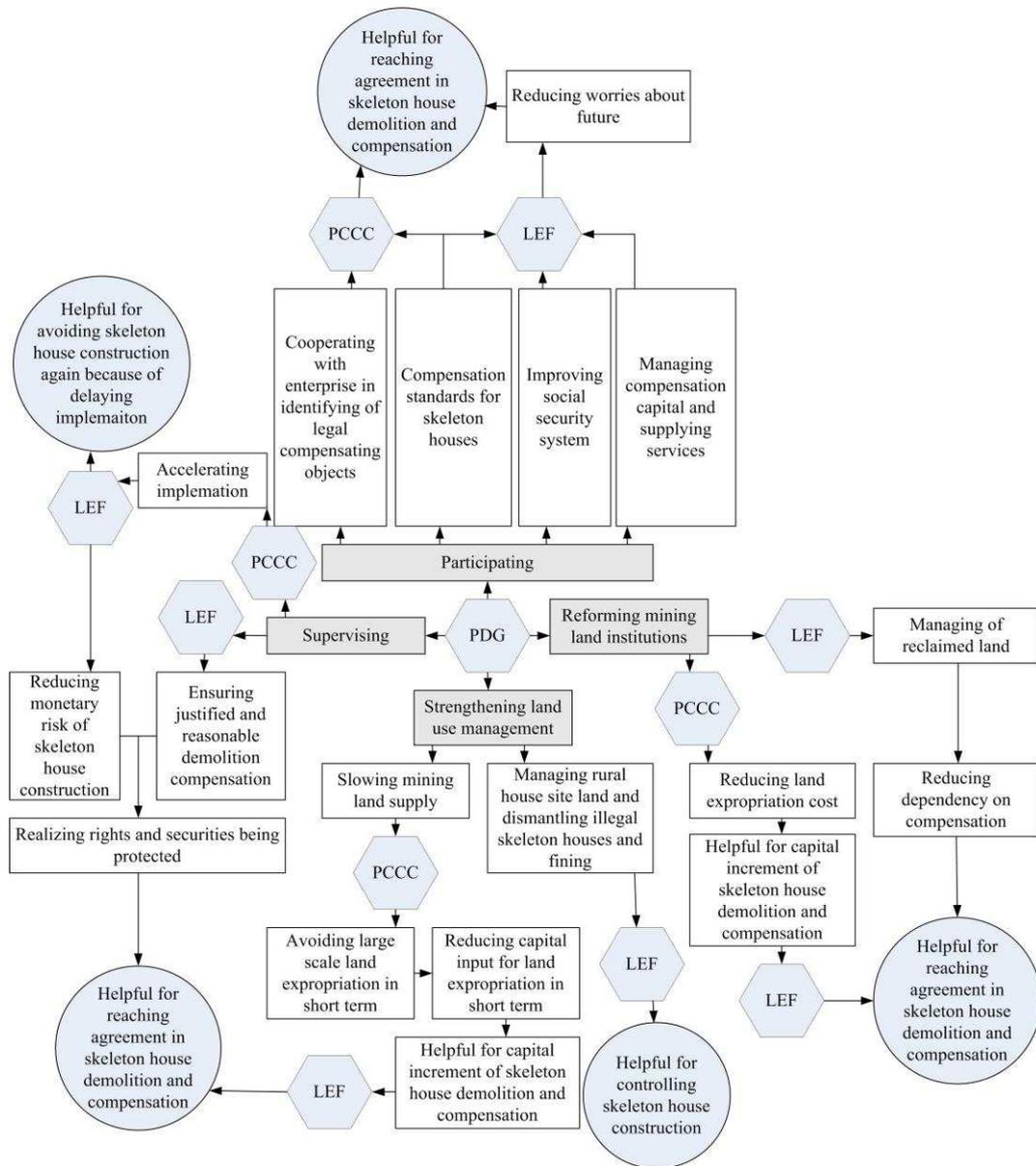


Fig. 5 Response process of Pinglu District Government (PDG) to skeleton houses

(3) Responses to land-expropriated farmers

Given that farmers are most impacted by the expansion of coal mining, they should play a role in shaping both how compensation is distributed, and the appropriate levels of compensation. The land-expropriated farmers should discuss the compensation standards and social security policies in the hearing meetings with the enterprise and the government (Fig. 3 and Fig. 6). Generally, if the land-expropriated farmers participate in making the compensation standards, they will feel more satisfied with the resulting schemes (Liu et al, 2012), thus ensuring the process awards reasonable levels of compensation. In addition, land-expropriated farmers should participate in funding various cooperative organizations and companies with their land

expropriation capital and the information and technology supplied by the government, and be paid interest according to their stocks (Bao and Peng, 2016). This will assist the land-expropriated farmers to have confidence that they will gain more benefits as a result of their own actions, rather than focusing entirely on getting more compensation from skeleton house demolition. Both of them will be helpful for PCCC to reach agreement in skeleton house demolition and compensation.

It is necessary for land-expropriated farmers to compare the current compensation standards with the former compensation standards, while also comparing present living standards of the former land-expropriated farmers with the original living standards (Fig. 3 and Fig. 6). This will help to allay farmers' concerns but also help PCCC and Pinglu District Government to make reasonable and considerate compensation standards and social security policies (Kang and Liu, 2015), helping to reach agreement on skeleton house demolition and compensation. The monetary opportunity cost and risk should be realized by the land-expropriated farmers who plan to construct skeleton houses five to ten years before land expropriation. The land-expropriated farmers said that they had not taken into account these costs and risks when they constructed skeleton houses. Farmers should not only be made more aware of their legal obligation not to construct skeleton houses after land compensation notices become public, but also avoid constructing them in the first place. Qin et al. (2015) indicated that skeleton house construction increases land expropriation costs and slows down farmer relocation. If they understood both of these things, it would reduce the incentive to build skeleton houses. Finally, farmers should also be made aware that compensation capital represent only one aspect of their future livelihood security (Fig. 3 and Fig. 6) and that any money should be reasonably spent (Wang, 2009).

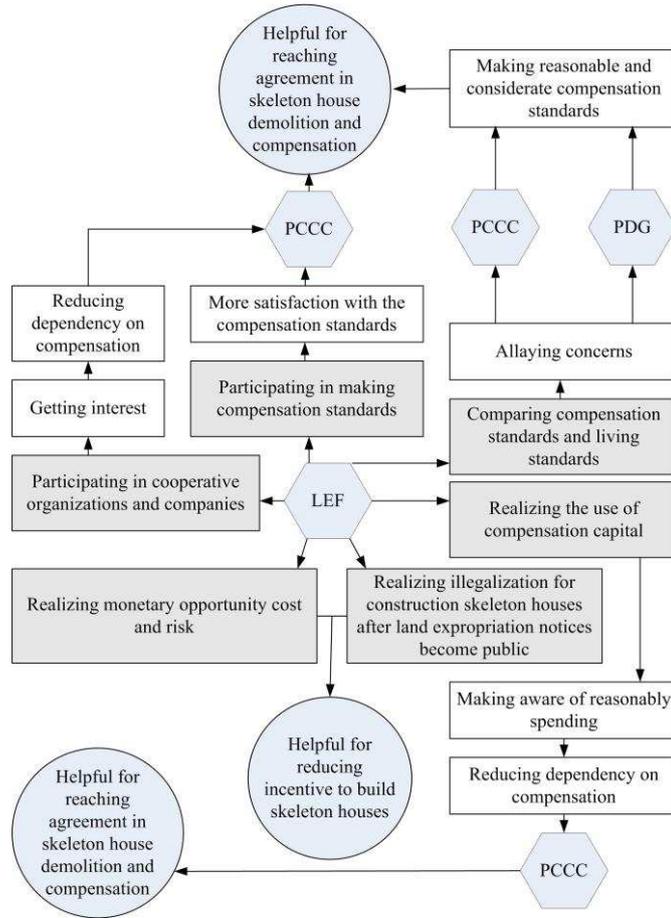


Fig. 6 Response process of land-expropriated farmers (LEF) for skeleton house

3.7 Interactive relationships and multiple stakeholder goals

House demolition compensation is one part of land expropriation compensation. Skeleton house construction can reflect both the issues of land expropriation compensation and the interactive relationships among multiple stakeholders. Overall, PCCC aspires to maximise economic benefits, including land expropriation cost reduction, and is reluctant to compensate the massive skeleton houses. Land-expropriated farmers want to get more compensation for the future security. Pinglu District Government depends on PCCC, yet hopes the land-expropriated farmers get more compensation. The interactive relationships among the multiple stakeholders are illustrated in Fig. 7. Some relationships have connections on both sides, and some of them do not, yet they need to be connected.

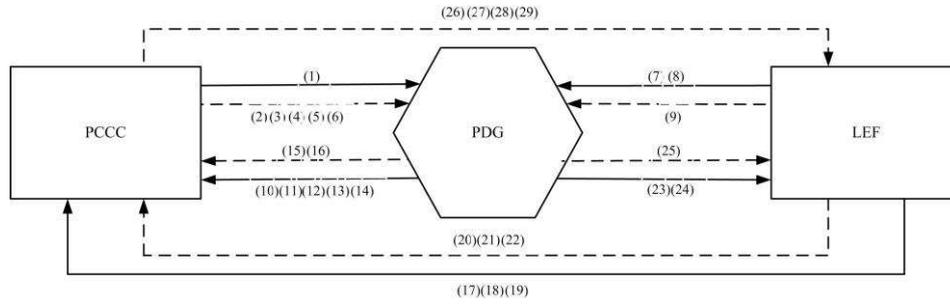


Fig. 7 Interactive relationships of the three stakeholder groups

Solid arrow: relationship has been connected; N: relationship hasn't connected.

PCCC→PDG: (1) supplying mining land; (2) making concrete land expropriation compensation legislation; (3) controlling skeleton house construction; (4) actively joining in land expropriation; (5) supervising land expropriation and compensation with special office; (6) reforming land expropriation institution.

LEF→PDG: (7) acquiescing skeleton house construction; (8) releasing residence base management; (9) perfecting social securities.

PDG→PCCC: (10) boosting economic development; (11) increasing population urbanization rate; (12) improving living standard; (13) increasing land expropriation compensation; (14) supplying jobs; (15) minimizing environmental impacts; (16) slowing down land expropriation.

LEF→PCCC: (17) increasing land expropriation compensation; (18) supplying jobs; (19) paying environmental compensation fee; (20) sufficient social securities; (21) minimizing environmental impacts; (22) making coal mining plans public.

PDG→LEF: (23) alleviating government's pressure; (24) reasonably using land expropriation compensation capital; (25) actively cooperating with PCCC.

PCCC→LEF: (26) stopping skeleton house construction; (27) comparing compensation standards; (28) realizing monetary opportunity cost and risk; (29) knowing the impact of skeleton houses.

4 Conclusions

Land use management in mining areas in China is complex and involves many competing interests and interactive relationships between stakeholder groups. This complexity is reflected in the variety of opinions and relationships that we have revealed in our analyses of PCCC, Pinglu District Government and land expropriated farmers, all of whom can play a role in, and would benefit from, reducing and eliminating skeleton house construction. PCCC would benefit from

investing in cleaner coal production methods, as this would reduce the amount of land required by their mines, minimise other environmental impacts and therefore minimise the numbers of farmers who they pay compensation to. This, ultimately, will reduce the costs of coal production and allow the Corporation to maintain profits. The Government should change its role from one whereby it promotes coal mining at almost any cost in order to meet economic and urbanisation targets, to one which protects the rights of farmers to fair compensation and comparable livelihood opportunities after relocation. Instigating a transparent and fair land planning process would be an important step in achieving this switch of roles. Finally, the farmers themselves need to play a role. If they are meaningfully brought into planning, compensation decision making and relocation processes, then they are more likely to feel that the compensation they receive is fair and, therefore, be less likely to exploit loopholes in legislation to artificially increase the amounts they receive through, for example, the construction of skeleton houses. Thus, the solutions to skeleton house demolition compensation not only rely on making compensation regulations, but also on connecting and smoothing the relationships among multiple stakeholders. Understanding multiple stakeholders' perspectives using the DPSIR framework as a tool to structure our analysis has allowed us to identify ways forward that target each group. Such multi-stakeholder analyses could be applied in other countries and contexts in order to reduce conflicts around land use change and identify fairer approaches to deliver reasonable compensation to land expropriated farmers.

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Appendix 1 Smi-structured interview questions

Interviewees	Questions
Pingshuo China Coal Corporation Staff (PCCCS)	● QSPCCC1: What were the difficulties in the process of land expropriation?
	● QSPCCC2: What did the land-expropriated farmers do in order to get more compensation?
	● QSPCCC3: What did Pinglu District Government do in the process of land expropriation?
	● QSPCCC4: What did you do about the impacts from surface coal mining?
	● QSPCCC5: What should the Pinglu District Government do in the process of land expropriation?
	● QSPCCC6: What should the PCCC do in order to control production costs?
Pinglu District Government Staff (PDGS)	● QSPDG1: How did the Pinglu District Government profit from coal industry?
	● QSPDG2: How did the Pinglu District Government reform the land expropriation institution?
	● QSPDG3: Did the expropriated-land farmers apply for permission to construct skeleton houses?
	● QSPDG4: Did the Pinglu District Government prohibit and dismantle the illegal skeleton houses?
Land- expropriated farmers (LEF)	● QLEF1: Did you know about and see the coal mining planning and land expropriation planning process?
	● QLEF2: What were the impacts to the land, the house, the groundwater and the crop in the coal mining areas?
	● QLEF3: Would you mind relocating on the reclaimed land?
	● QLEF4: What were the compensation standards for land expropriation and skeleton houses?
	● QLEF5: What were the sources of funding for constructing new houses?
	● QLEF6: What did people do when you got such a high compensation capital?
	● QLEF7: How satisfied were you with the living conditions after relocation?