

Report to the World Bank, as part of the Southern Mongolia Urban Infrastructure Background Study

Executive Summary

What is the context for this paper? The economic opportunities created by large new mines in Mongolia's South Gobi region are likely to attract migrants. These migrants will need infrastructure services currently in short supply in South Gobi and the surrounding aimags.

An increase in the demand for infrastructure in South Gobi presents, on the one hand, opportunities for economic growth, and on the other hand, the potential for economic, social and political problems.

What is the purpose of this paper? The purpose of this paper is to inform the Government's thinking about the development of population centers around the mines in South Gobi; helping it to make the most of the opportunities for economic growth, while minimizing the potential for economic, social and political problems.

This paper draws lessons from international experience with population change and infrastructure development around mines, and analyzes the relevance of those lessons for areas near large new mines in Mongolia's South Gobi region. More specifically, the paper focuses on experience in mining areas with:

- Regional and local population changes that occur as a result of an increase in mining activity. Throughout this paper, we call "influx" any change in these categories of population that the mining company or government do not specifically plan for
- The ways in which infrastructure is developed to support the population that lives in the vicinity of the mines.

What theoretical framework is used? This paper assumes that the extent to which mining populations change around a mine depend on:

- The actions of governments and the mining companies.¹ Each actor has a different set of objectives. A government's objectives are to maximize economic and social welfare for the country. A mining company's objective is to maximize profit. Agreement on how government and mining companies' objectives are met is reflected in formal agreements (such as an investment agreement) or tacit agreements (what mining companies sometimes call their "social license to operate") between governments and the mining companies
- A mining area's unique characteristics. These characteristics are largely beyond the control of mining companies and governments and include, for example, the geographic, demographic, and socio-economic characteristics of areas near the mine. Important characteristics are the remoteness of the mine, the climate at the mine, and the disparity of incomes and quality of life between what is offered near the mine, and what is offered in nearby areas.

The way in which a mining company recruits and settles workers is one of

¹ We assume throughout this paper that governments issue the rights to extract mineral resources from particular area.

What are the models for recruitment and settlement of workers?

the most important determinants of how populations will change and what sort of infrastructure will be provided.

This paper has identified four recruitment and settlement models, based on a review of practices at more than 20 mining operations. These models differ primarily in at least one of the following three characteristics:

- Whether the mining company hires staff in areas local to the mine, elsewhere within a country, or from outside the country
- Whether the mining company houses its workers inside the area within which the mining company has rights to operate (sometimes referred to as ‘inside the mine gate’), or outside that area
- Whether the mining company makes infrastructure available to mine workers only, or also to non-miners.

The four main models for recruitment and settlement are:

- **Company town.** In the company town model, a mining company builds and operates an entire town, outside the mine gate. The mining company builds and operates all basic infrastructure necessary to accommodate miners and their families, and may also build and operate recreation and leisure facilities (for example, restaurants, retail shops, community centers, hotels, and movie theaters). In building the company town, mining companies also generally plan to accommodate the supplier and contract population, the service population, and possibly some of the existing population. Recruitment strategies in the company town model vary considerably from case to case. The recruitment of miners may be from local areas or may be from distant areas
- **Fly-in, fly-out (FIFO).** In the fly-in, fly out model, workers and their families live in regions, often metropolitan areas, located far away from the site of mining operations. Typically, workers commute to the mining site on a “14-days on/7-days off” rotation or “9 days on/5 days off” rotation. In this model, there is no recruitment from, and no infrastructure development in local communities. The mining company builds a mining camp, inside the mine gate, with enough infrastructure for mine employees only. A variation on the FIFO model is the bus-in, bus-out (BIBO) model used where commuting distances allow for it, or airstrips are not available
- **Integrated community.** In the integrated community model workers and their families live within existing communities located near the mine. The mining company contributes to infrastructure development in these communities in varying degrees. If the mining company does provide some infrastructure, non-miners are typically not excluded from that infrastructure. Workers are often recruited locally under this model, but may also be recruited from elsewhere, and required to relocate to the existing towns around the mine
- **Gated community.** In the gated community model, workers and their families are housed in a new neighborhood bordering on, or within an existing local community. The gated community is outside the mine gate, and has most infrastructure necessary to support miners their families. The mining company may make use of some existing infrastructure, such as roads or electricity connections, to provide service to the gated community, and may expect that, for leisure and

What has international experience shown about the company town model?

entertainment, workers will leave the gated community. Workers may be hired locally, from elsewhere within the country, or from abroad.

International experience has shown that in the company town model:

- Population growth is high, and influx will be high because the mining company builds a town where none existed. Average annual population growth in the company towns we surveyed always exceeded 10 percent. Non-mining populations are often attracted to the mining town because of the promise of jobs, or the availability of infrastructure services
- Infrastructure service may be stretched by the influx. For example, the owner of the Zouerate mine in Mauritania (SNIM) controls the supply of electricity to the city, and provides electricity free of charge to mining employees and their families. The majority of non-SNIM households also have electricity connections, but high levels of non-metered and illegal connections in non-SNIM areas forced the company to stop making new connections in 2004
- The cost to the mining company of building a company town is usually higher than the cost to the mining company of other recruitment and settlement models, because of the high levels of capital expenditure required
- Company towns show positive and negative social impacts. Positive social impacts of the company town are the health benefits of the family-centered style of accommodations. Negative social impacts of the company town model come from the town's dependence on the mining company for employment and economic activity. When mines close, families must often move in order to find employment opportunities elsewhere. Few alternative employment opportunities typically exist due to the remoteness of many mining operations, and where such opportunities do exist, mine workers may not have transferrable skills
- Mining royalties will likely be lower in this model than in the other models because the mining company's upfront investment in infrastructure is higher than in the other models.

What has international experience shown about the fly-in, fly-out model?

International experience has shown that in the fly-in, fly-out (FIFO) model:

- Population growth is low, and influx is typically low because the mining company builds and operates only the infrastructure required for mining operations and to accommodate workers (without their families) at the mining camp. Workers are not recruited locally. Population growth in the FIFO models we reviewed for this paper was negative (two examples in Western Australia, and Boroo Gold's mine in Mongolia)
- Mining companies see the FIFO model as a better alternative to the company town model because upfront capital expenditures on physical infrastructure are lower. Over the past two decades, the FIFO model has been extensively utilized in remote areas of Western Australia and Canada's Northwest Territories. FIFO is typically lower cost for smaller mines. Larger mines have disproportionately higher transport costs when using FIFO, due to larger labor requirements and longer lifetimes of operation. Mining companies also prefer FIFO because they can draw from a larger pool of workers
- FIFO has a positive social impact in that it allows workers some flexibility to choose where they live. The only requirement is that they be able to reach the airport from which they are flown to the mine site.

FIFO also has a limited cultural, environmental, or economic impact on local areas, because the increase in the mining population is limited to mine workers, and is kept within the mine gate. FIFO's negative social impacts may include an increase in family dysfunction and parenting problems as a result of workers' prolonged separation from their families. FIFO also provides no direct jobs or infrastructure near the mine site. This may cause tensions with local populations who feel they should benefit from the mine's presence

- The overall welfare savings will be greater with FIFO than with the other models if it saves the mining company money that can be made available as royalties for the government.

What has international experience shown about the gated community model?

International experience has shown that in the gated community model:

- Population growth will be moderate (2-3 percent per year in the cases we reviewed), and influx moderate to high, depending on the extent of economic interaction between populations within the gated community, and the existing population. For example, the Candelaria Mining Company in Atacama, Chile built a separate housing enclave for managers and upper executives of the mine. Local community members note that mine employees tend to spend their wages on recreation in other parts of the region, rather than at local businesses. In contrast, at the Escondida mine in Antofagasta, Chile, there is much more interaction between mining families and the local population. Employment and income multiplier effects around Candelaria are consequently less than half what they are for Escondida
- More upfront infrastructure investment is required than under FIFO, because the gated community must support workers and their families living near the mine on a permanent basis. Some of the gated community models surveyed in this paper (for example, El Pinar) also lie far enough from the mine site that mining camps must also be built, and workers bused-in and bused-out from those camps. The upfront capital costs of the gated community model are therefore likely to be higher than in the FIFO model, but lower than in the company town model
- The positive social impacts include the health benefits of workers living with their families, and the more limited cultural, environmental, and economic impact on local areas than under the company town model. Negative social impacts stem from possible social tensions between the mining population and existing population
- The economic impact depends, as in the other models, on how much infrastructure expenditure the mining company must make and therefore how much money is left over for royalties or other payments to the government.

What has international experience shown about the integrated community model?

International experience has shown that in the integrated community model:

- Population growth, and influx range from low to high. The cases we surveyed saw annual population growth ranging from 1 percent (in Tierra Amarilla, Chile) near the Candelaria mine, to 26 percent (in Canaã dos Carajás, Brazil) near the Sossego mine
- The financial implications for the mining companies vary depending on how much the companies spend on infrastructure or social services in

the communities near the mine. This in turn depends on what infrastructure already exists to support workers, and what additional infrastructure the mining company feels it needs to build in order to comply with its social license to operate. The integrated community model generally requires less capital expenditure than the company town and gated communities' models. Because workers live close to the mine, there may also be savings on transport costs relative to the FIFO model

- Positive social impacts of the integrated community model include the fact that workers can live with their families, and the fact that existing populations around the mine stand to benefit from infrastructure and jobs created by the mine. Negative impacts include the risk of social tensions because of cultural differences or income disparities between the mine workers and existing population
- If under this model, the mining company can save money they would otherwise spend on infrastructure and transport costs, it also means more cash available for government royalties and hence higher welfare.

What are the lessons for South Gobi from international experience?

International experience shows that the best choice of recruitment and settlement model depends on the situation. South Gobi's situation can be compared to the international examples based on:

- Similarities between South Gobi and the cases in Section **Error! Reference source not found.**, in terms of exogenous variables
- Indications, from some of the mining companies involved, or likely to be involved in operating mines in South Gobi, of their preference of recruitment and settlement models.

On what basis can South Gobi's mines be compared?

The international examples most relevant to South Gobi are those in which the mines are in areas with geographic, demographic and socio-economic similarities to South Gobi. The most important characteristics for comparison are related to remoteness of a mine, the climate at a mine, and disparity of income and quality of life (which depends at least in part on infrastructure and social services available):

- South Gobi's mines are in areas that are hard to reach from large urban centers. Oyu Tolgoi is roughly 220 km from the aimag capital of Dalanzadgad, with unmaintained dirt roads providing the only link. This remoteness is similar to Zoureate in Mauritania, El Teniente in Chile, Antamina in Peru, and all of the examples in Western Australia
- South Gobi's mines are, however, quite near to small centers of populations (soums). Production at Oyu Tolgoi's copper mine is likely to take place roughly 40 km from the soum center of Khanbogd, a town of roughly 2,500 people. Production at Tavan Tolgoi is already taking place roughly 7 km from Tsogttsetsii, a soum center with a population of 500-600 (the total population in the soum is roughly 2,500. In this respect, South Gobi's mines are in areas similar to the areas around Antamina, Inti Raymi in Bolivia, and Candelaria
- South Gobi's mines are in a climate characterized by a climate viewed by some as inhospitable, and therefore unattractive to move to. South Gobi's temperatures fluctuate as much as 40-60 degrees Celsius from one season to another. Winters see heavy snows and extreme cold. Summers see extreme heat and winds. Zoureate, Candelaria in Chile, Diavik in Canada, and the mines in Western Australia are also in climates often viewed as inhospitable

- The availability of skilled labor in South Gobi is low. The government has signaled (and included in draft investment agreements) a requirement that strategic mining investors will have to use as much Mongolian labor as possible in their operations. Mongolia has a well-trained mining labor force at Erdenet, and some with mining experience have migrated to Ulaanbaatar. Erdenet has only road and rail links to Ulaanbaatar. Flights are available from Ulaanbaatar to Dalanzadgad, but Dalanzadgad lies another than 100 km from Tavan Tolgoi, and more than 200 km from Oyu Tolgoi.
- Incomes are low relative to the wages that will be offered that mines. Average household income in Mongolia is 250,000 Tugrik (US\$217) per month. Mongolia's mining companies, in contrast, typically offer some of the highest wages in the country. Erdenet pays its mine workers, on average 700,000 Tugrik (US\$608) per month. The lowest paid workers at Erdenet make just over 100 Tugrik (US \$88) per month. Energy Resources Mongolia plans on paying its laborers roughly twice this wage at its camp in Tavan Tolgoi, in addition to providing camp facilities. Any future mining operations in Mongolia will have to compete with these wages
- The availability of infrastructure and social services are low in South Gobi relative to what even a basic mining camp is likely to have. Roughly 80-90 percent of people in Mongolia's secondary towns live in gers (compared to roughly 45-60 percent of the population in Ulaanbaatar).² The population living in these gers typically heat with coal or animal dung, use open pit latrines, and rely on local boreholes or water vendors. Populations living in soum centers may have electricity service in their ger, but only for part of the day (for example, residents living in gers in Tsogttsetsii have electricity 5 hours per day).

What recruitment and settlement models are mining companies likely to use?

Two of the mining companies expected to start mining at the large coal and copper deposits in South Gobi have begun to study possible recruitment and settlement models. Consultants to Ivanhoe mines have recommended an approach which appears to be a hybrid of the integrated community and fly-in, fly-out models, for copper mining operations at Oyu Tolgoi. Energy Resources Mongolia appears to be planning a recruitment and settlement model that is a hybrid between a gated community and fly-in, fly-out approach.

Consultants to Ivanhoe Mines have recommended the following, for example:

- Employees hired in Khanbogd will be based in Khanbogd and commute daily to site
- Seventy-five percent of regionally recruited employees will maintain current residence in South Gobi regional town and bus-in, bus-out (BIBO) on a nominated roster; 25 percent will relocate to Khanbogd
- Twenty-five percent of employees migrating from other regions (primarily Ulaanbaatar) will relocate to Khanbogd; 70 percent will be based in a camp on site and FIFO to Ulaanbaatar on a nominated roster; 5 percent will be relocated to another South Gobi town

² Urban Development Resource Center, Mongolia. Presentation to the Asian Development Bank. May, 2008. (<http://www.adb.org/Documents/Participation/Session-III-Ad.pdf>).

- Twenty percent of expatriate staff will relocate to Khanbogd with their families; 80 percent will FIFO to designated country via Ulaanbaatar
- Twenty-five percent of contractors will be based in Khanbogd; 75 percent will relocate to another South Gobi town.³

Energy Resources Mongolia is planning a 1000 person camp roughly 1 km from the soum center of Tavan Tolgoi, and roughly 7 km from Tsogttsetsii soum center.⁴ Roughly 500-600 workers will fly-in, fly out from the camp, and be housed in pre-fabricated, dormitory style housing. The prefabricated housing will have 24-hour electricity and water supply, heating, air conditioning, and indoor sewerage. Another 500 workers (predominantly drivers) will live permanently in gers next to the prefabricated housing, but within the camp gates.

What is the potential for influx?

The potential for influx around Mongolia’s mines will be determined by the geographic, demographic, and socio-economic situation in South Gobi, and the mining companies’ choice of recruitment and settlement model. These factors point to moderate to high influx in South Gobi as a result of the increase in mining activity.

The remoteness of the mine sites, and severity of climate is likely to keep migrants away, unless they have concrete offers of employment. Some of the mine sites, will, however, over time become less remote as roads, rail and air transport is improved between the mine sites and other parts of the country.

Socio-economic conditions are likely to draw migrants are the relatively higher incomes available through employment with the mine, and the likelihood that—if made available to non-miners—the infrastructure services are likely to be much better than what is currently available in most parts of South Gobi and the neighboring aimags.

Mining companies’ preferences for recruitment and settlement model point to:

- Using the integrated community model, for most workers at large mines
- Using the FIFO model for workers at small mines, with a possible evolution from FIFO to an integrated community model. FIFO will also be used for expatriate and some Mongolian workers at the large mines.

Given the life span of the mineral deposits at Tavan Tolgoi and Oyu Tolgoi, and the proximity of some local towns, most coal and copper mining operators are likely to lean toward the integrated community model, using FIFO for expatriate or more senior Mongolian employees.

What are the likely social impacts?

The mix of integrated development and FIFO models seems appropriate given the mining companies’ objectives, the government’s social and economic consideration, and the realities of geography, demographics, and socio-economic conditions in South Gobi. Ultimately, the success of these models at meeting social and economic criteria will depend on how they are

³ Taktics4. “Oyu Tolgoi: Housing Location Strategy.” November 2007. 15.

⁴ Energy Resources Mongolia is currently negotiating the right to produce in a small area at the northern end of the Tavan Tolgoi coal deposit. It is our understanding that the Government of Mongolia has not yet found a strategic investor (or investors) to operate in the other parts of Tavan Tolgoi.

implemented once mining operations begins.

The integrated community model recognizes the important factors for social success, namely:⁵

- The Mongolian public, and the population in South Gobi, appreciate the unique size and value of the reserves in South Gobi, and therefore expects to see tangible outcomes such as jobs, training, and infrastructures result directly from the mining activities
- There is an expectation that Mongolian mining expertise will be used to the fullest extent possible in staffing the new mining operations
- Government officials and the general public expect the mining companies working in South Gobi to take an active role in providing some infrastructure near the mines, including infrastructure meant to serve the non-mining populations.

These negative social impacts of the integrated community model can be avoided, depending on how the model is implemented. International experience suggests the negative impacts can be avoided by:

- Ensuring that local governments receive a share of the welfare benefits. For example, 50 percent of income tax paid by the Yanacocha Mining Company remains in the Cajamarca area in Peru.⁶ This has provided the local government with ample resources to invest in government-sponsored service and infrastructure development policies and improvements. In contrast, local government officials in Mongolia have noted difficulty in retaining and spending revenues owed to the soums and aimags under the Mining Law, in part because of the way in which annual budgeting takes place between the aimags and national government
- Developing local institutional capacity, through the establishment of foundations or development programs that pool resources of the mining companies, local governments, non-governmental organizations and international financial institutions. Foundations or development programs help coordinate infrastructure planning and development between local governments, and train the governments or local community members to operate the infrastructure once it is built
- Promoting sustainability of the non-mining economy by:
 - Encouraging economic diversification while the mine is operating. Erdenet offers an example of how this has been done well. Erdenet's copper mine still has an estimated 30-40 years of life, but in its first 30 years, the town has managed to employ roughly 80 percent of the population in non-mining jobs. As another example of how this has been done in Mongolia, Boroo Gold uses a local catering company for its mining camp, and obliges the catering company to buy food locally
 - Ensuring the local government has a plan for what to do when mining resources are exhausted, or the mine shuts down

⁵ Based on Castalia's interviews with National and Local Government officials.

⁶ Pascó-Font, Alberto et. al. "Chapter 4. Peru: Learning by Doing." Large Mines and the Community: Socioeconomic and Environmental Effects in Latin America, Canada, and Spain. Eds. Gary McMahon and Felix Remy. IDRC/World Bank, 2001.

What is the likely economic impact?

unexpectedly.

Governments can maximize the overall value of a mining concession by requiring competitive bids for the resource. What mining companies are willing to pay for a mining concession depends on what they think they can earn from it. Mining companies will generally offer higher royalties for more profitable concessions, in order to win the right to that concession.

Governments can maximize the cash they receive from a mining operation by allowing the mining company to adopt whichever model is most profitable, and allows it to pay the most royalties to the government. A government must then obviously weight this against the net welfare effects under each of the models of any social impacts.

A review of the recommendations made by Ivanhoe Mines' consultants, and Energy Resources' plans for Tavan Tolgoi show that the recruitment and settlement models they have in mind are consistent with the life span of the reserves they each have to exploit, the remoteness of the location and the availability of labor in the area. We therefore expect that the Government of Mongolia is—at least in broad terms of the model selected for recruitment and settlement—maximizing the cash payments it can receive.

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