

Resource Extraction Impact in Asia and Mongolia

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Abstract: Asia is the largest of the world's continents, covering approximately 30 percent of the Earth's land area. It is also the world's most populous continent, with roughly 60 percent of the total population 4.4bln. The border between the two continents is debated. However, most geographers define Asia's western border as an indirect line that follows the Ural Mountains, the Caucasus Mountains, and the Caspian and Black seas. Asia is bordered by the Arctic, Pacific, and Indian oceans. Today, Asia is home to the citizens of 48 countries, two of them (Russia and Turkey) having part of their land in Europe.

Key words: resource extraction, mining problems, artisanal mining, pollution

1. Natural Resource Extraction in Asia

Asia's stake in world markets has grown dramatically in the last half-century. Today, Asian countries rank as some of the top producers of many agricultural, forest, fishing, mining, and industrial products. This increased production has brought both extreme wealth and negative environmental impacts to the continent.

Hardier grains, such as barley, buckwheat, millet, oats, and wheat, are grown in the central and southern areas of this zone, where permanent frosts inhibit plant growth. Animal husbandry is also very important in this zone. In Mongolia, for example, 75 percent of agricultural land is allocated to the rearing of livestock. In 2010, Asia harvested almost 570 million metric tons of rice, accounting for more than 50 percent of the continent's total cereal production — and roughly 90 percent of total global rice production.

Timber industry. Forestry, the management of trees and other vegetation in forests, is an important but threatened industry in a select group of Asian countries. China is a major exporter of wood products, ranking first globally in wood-based panel production, paper,

and wood furniture. During the past 10 years, Asia has increased its forest cover by 30 million hectares (74 million acres) to create forest plantations where trees can be intensively managed for higher-yield production.

Asia represents the most important region for fisheries and aquaculture production in the world. Asia's marine fishing areas produced roughly 50 percent of the global fish capture. Six of the top 10 world producers of fish are found in Asia. Asia also produced about 90 percent of the world's aquaculture-raised fish. A recent study by the National Geographic Society places China and Japan as the world's leading consumers of seafood, at roughly 765 million and 641 million tons annually.

1.1 Mining



Fig. 1 Tavantolgoi coal mine South Gobi Mongolia.

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Extractive activities are an important part of the economies of many Asian countries. China, India, Russia, and Indonesia are the continent's most productive mining economies. These countries extract many of the same minerals. China is the world's largest producer of aluminum, gold, tin, and coal. India is also a major producer of aluminum and iron ore, along with other minerals such as barite, chromium and manganese. Russia is a major producer of coal, tungsten, diamonds, iron, and steel. Countries on the Arabian Peninsula have the world's largest deposits of oil and natural gas. In 2010, Saudi Arabia was the world's largest manufacturer of petroleum liquids, producing 10.07 million barrels of liquid fuels every day. It also has the world's largest oil reserves, at roughly 250 billion barrels. Saudi Arabia's economy is heavily dependent on oil exports, which account for 80 to 90 percent of the country's total revenues. Saudi Arabia, Iran, and the United Arab Emirates accounted for roughly 57 percent of global liquid fuels production in 2010.

Another major player in Asia's liquid fuels industry is Russia. Russia has oil reserves in Siberia, and massive natural gas reserves throughout the Arctic. Russia is the world's largest producer of natural gas, and the largest supplier of natural gas to Europe. Russia has not aggressively drilled in the Arctic Ocean, but engineers say the area holds millions of barrels of oil and gas reserves. A surge of economic investment, primarily funded by the oil, technology, and pharmaceutical industries, has fueled the development of medium-sized cities into important metropolitan areas. Two urban areas that demonstrate this are Hyderabad, India, and Dubai, United Arab Emirates.

Gold and coal China has recently made that country the world's largest gold producer. For the year 2015 gold output rose 490 tones and became the world's largest. On the other hand, gold output in China has risen by 70% for the past decade. It burns 24 percent of the world's coal. China has been by far the biggest coal producing country over the last three decades. The

country produced about 3.6 billion tons of coal in 2012 accounting for over 47% of the world's total coal output. China has 126 billion tons of coal, enough to last 75 years if consumption rates remain the same. Coal-fired power plants are the biggest source of human-made carbon dioxide emissions. This makes burning coal the single greatest threat facing our climate. Apart from climate change, coal also causes irreparable damage to the environment, people's health and communities around the world. From mining to combustion, coal is the dirtiest fossil fuel on the planet, producing air and water pollution and liquid and solid waste.

Coal is the single biggest source of climate-changing pollution. Coal mining destroys ecosystems and releases toxic levels of minerals and gases into water and air. The impacts of air pollution are far reaching: for example, mercury pollution from coal-fired power plants can travel thousands of kilometers. Burning coal creates millions of tons of waste products that contain toxic levels of heavy metals and minerals. Coal consumption increases at a rate of 10 percent a year.

Copper in Asia. Again China is the biggest producer of copper in Asia. In 2014 China has produced 1.760 thousand tons of copper a year while Chile 5.750.000 tons. Other biggest copper producers in Asia are Russia /742.000t/, Kazakhstan /494.000t/, Iran /494.00t/ and Mongolia is the 17th biggest producer in the world. /122.000t/.

Diamond. Russia is one of the world's largest producers of gem quality diamonds. Russia accounts for 21% of global diamonds produced. Russia's main diamond mining enterprise, AlmazyRossii-Sakha, which mines over 98% of the country's diamond output in the Sakha/Yakutsk Republic. Alrosa Group, one of the biggest producers of diamonds in the world, plans to mine \$1.636 billion worth of the gems this year, including \$1.500 billion by the group's flagship company ZAO Alrosa.

2. Mining Problems in Mongolia

The mining giants have given a major boost to its economy: in 2014, Mongolia's GDP is slated to spike by 15.3 percent, the highest growth rate in the world. In 2012, minerals comprised 30 percent of the GDP and more than 80 percent of exports, according to the Mongolian Research Group of the Centre for Social Responsibility in Mining.

2.1 Largest Mines in Mongolia

The OyuTolgoi mine is a combined open pit and underground mining project in the south Gobi desert near to Chinese border. The site was discovered in 2001 and is being developed as a joint venture between "Turquoise Hill Resources" with 66% ownership and the Government of Mongolia with 34%. The mine began construction as of 2010 and the mining project is the largest financial undertaking in Mongolia's history and is expected upon completion to produce 500,000 tons of copper annually. OyuTolgoi LLC, the world's largest copper deposit and official site of strategic importance in Mongolia. The OyuTolgoi mine is expected to produce 30 percent of Mongolia's GDP by the time it reaches full production in 2021, according to the International Monetary Fund.

Erdenet Mining Corporation. Erdenet city was built in 1974 to exploit Asia's largest deposit of copper ore and has the fourth largest copper mine in the world. The "Erdenet Mining Corporation" is a joint Mongolian-Russian venture, and accounts for a majority of Mongolia's hard currency income. Erdenet mines 22.23 million tons of ore per year, producing 126,700 tons of copper and 1954 tons of molybdenum. The mine accounts for 13.5% of Mongolia's GDP and 7% of tax revenue. About 8,000 people are employed in the mine.

Boroo Gold Mine is an open-pit gold mining site located in northern Mongolia. Gatsuurt gold mine is near by Boroo Gold Mine. Boroo is owned by the Canadian mining company, Centerra Gold Inc. It began commercial production in March 2004 and produced



Fig. 2 OyuTolgoi copper mine South Gobi.

more than 1.5 million ounces (46 tons) of gold through the end of 2010. The Boroo mine was the first hard-rock gold mine established in Mongolia.

The Erds Coal Mine is a coal mine located in eastern Mongolia. The mine has coal reserves amounting to 807 million tonnes of coking coal, one of the largest coal reserves in Asia and the world. The mine has an annual production capacity of 0.1 million tons of coal.

Tavan Tolgoi ("Five Hill") is one of the world's largest untapped coking and thermal coal deposits, located in the southern Mongolia. It has a total estimated resource of 6.4 billion tons, one quarter of which is high quality coking coal. More recently, private investors, responding to an improved investment climate, have concentrated almost exclusively on six high-value export metals: gold, copper, zinc and uranium, plus fluorspar and coal.

Gold production mainly comes from placer operations, but output is stagnating as large readily accessible rich deposits are depleted. Exploration by an estimated 200-plus placer drilling rigs is now compensating for the decline with new discoveries.

2.2 Artisanal and Small-scale (ASM) Gold Mining

Unlike many other developing countries, ASM is not part of traditional subsistence economy in Mongolia. There is a wide range of opinions about the number of artisanal and small-scale miners in Mongolia,

stemming from the large size of the country, the lack of a full survey, the practical difficulties of counting ASM at any given site, and the substantial seasonal fluctuations in numbers and geographical distribution.

According to government estimates, there are about 30,000 informal gold miners. For fluorspar, there is consensus that several thousand ASM operations have become active in fluorspar mining and processing in the last four years. In addition, there are perhaps no more than about 1,000 informal miners engaged in mining of materials serving local needs, such as salt, clay, and sand. Possibly another 500 informal miners are engaged in illegal mining and export of fossils, semi-precious stones, meteorites, and mineral specimens.

The environmental impacts of ASM are also significant and represent a growing concern in Mongolia (Grayson and Murray, 2003).

Air pollution. Low air quality from ASM is posing a growing health threat. Dust generated by placer ASM — from shovelling, scraping chiselling, bagging, and spillages in a confined space with poor ventilation — causes eye injury, bronchial complaints, and silicosis. Even more dangerous is the smoke from fires to melt permafrost, particularly black smoke from tires. The sheer volume of smoke is known to be exerting a strong negative impact on the health of the miners and livestock.

Water Pollution. ASM is considered the main cause of substantial deterioration in water quality in several rivers across the country. Thousands of placer ninjas are aggravating the situation by using fire to melt the permafrost. Local loss of permafrost prevents the spring thaw getting to the main river, the water now pouring through gaps in the once continuous permafrost seal.

Mercury Pollution. Pollution from mercury is a substantial problem, particularly in the Boroo River due to informal mercury panning; the overall resulting health impacts are believed to be serious; however, to date no systematic testing has been done, and no



Fig. 3 Tracks carrying coal near border to China.



Fig. 4 Tsenher river in Arhangay, Mongolia.

specific measures have been put in place to address this problem. Not only is mercury polluting rivers, but it is also found in high quantity in the soil. A 2002 study by JICA documented high mercury levels in contaminated soils at the site of the disused Boroo gold recovery factory. Mercury-contaminated soil is used for grazing by sheep, goats, horses, and cattle.

Cyanide pollution. Cyanides used to use for gold amalgamation. Mass contamination by cyanide happened in 2007 nearby Darhan city, in village Khongor when ASM people used the cyanides in the open air. Also in Gobi region happened several times cyanide contamination of wild and domestic animals. Biggest user of cyanides in Mongolia was Boroo Gold mining, 800-1000 tons per year.

Arsenic pollution. Gold mining and processing are also known to enhance the release of arsenic and its uptake by humans and livestock. According to the Investigating arsenic (As) occurrence and sources in

ground, surface, waste and drinking water in northern Mongolia reported by Martin Pfeiffer and others in the journal "Springer" 2014, the highest concentration of arsenic (As) was detected in the effluent of a gold mine (up to 2,820 lg L-1). Five of 54 drinking water samples and 16 of 184 river samples were found to contain As levels above the World Health Organization (WHO) maximum permissible limit (10 lg L-1), with a maximum of 300 lg L-1 As.

3. Social Impacts

Mining companies could be a valuable component of a diversified rural livelihood economy. This is arguably true of the small industrial cities built to serve the soums in which 200 placer gold mines are operated by 128 companies. When asked, company managers claim it makes management much easier, as it stifles emergence of local networks around the mines, and ensures simpler discipline and better work ethics. Rural people see the placer mines as being destructive of nature, grazing, and winter shelters and contributing little to the local economy.

3.1 Risks to Health and Environment

Mongolia's semi-arid South Gobi region is dotted with large-scale mining projects, proof of a veritable gold rush. Recent mining driven economic growth is causing threats to the environment and livelihood of herders. Land use of mining is not compatible with the Mongolian culture of cherishing the environment and ecology. In semi-arid areas like South Gobi, the extreme dust generated from poorly planned dirt roads built for mining operations is compromising the health of local people, as well as their herds of horses, goats, sheep, yaks and camels. The creation of these roads, which cart truckloads of minerals to neighboring China and run through areas where many animals graze, also leads to high degradation of pasturelands. Furthermore, mining can impact the quantity and quality of surface water and groundwater. It often discharges sediment

particles, threatening fish species and the invertebrates that rely on them for food.

Mining-related infrastructure projects are affecting the health and habitat of animals crucial to Mongolia's nomadic herders.

In conclusion about Centerra Gold's Gatsuurt project in Mongolia. The project area contains 50 tons of gold and the gold deposit Sacred Mount Noyon feeds eight small rivers in the area and contamination of this water resource will have an impact on Baikal lake across the states. Local population is against the Gatsuurt mine because the contains of arsenic in gold rocks in this region are very high /46000mg/kg/ exceeding almost 5000 times of WHO standard. The levels of arsenic in ground wells and surface waters in this region, has been substantiated by a 2014 environmental study. A team of Mongolian and German researchers investigated the incidence of arsenic in ground, surface, waste and drinking water in Northern Mongolia, concluding that concentrations of arsenic in the tailing ponds (Boroo and Gatsuurt mines) could contaminate the environment in the coming years. The previous miner's tailing pond is a reminder of the potential impact.

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