Rare earth mining in Kachin State, Myanmar:

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Rare earth mining in Kachin State, Myanmar: Labour practices and working conditions

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Research project and research aims

This is the third of a series of Briefing Papers on the impacts of rare earth mining in Kachin State. The research that underpins these briefings is from a two-year research project (2022-2024) jointly led by the University of Warwick and Kachinland Research Centre (KRC) entitled Local Impacts of Rare Earths Elements Extraction in the Myanmar-China borderlands.

The research project has three key aims:

1. To generate a new evidence base on how the rare earth mining sector operates in northern Myanmar and the impacts that it is having on local populations and environments.
2. To engage with communities, civil society organisation and other local stakeholders so that research findings can inform responses to mining activities, especially efforts to mitigate the harms generated by current mining practices.
3. To engage with policymakers and practitioners working in Myanmar about what is happening in rare earth mining areas of Kachin State to inform policy processes seeking to support responsible mining practices and to mitigate social and environmental harms in these areas.

Dataset and methodology

Research is based on more than 120 in-depth interviews with local mine workers, residents, customary leaders and local authorities in mining areas, civil society organisations working on social and environmental issues, and local researchers. The dataset also includes several life stories to better understand how the changes wrought by rare earth mining impact on the everyday lives of those living and working in mining areas. Most research participants were Kachin identifying individuals and all research was undertaken in local languages.

Rare earth mining takes place in two regions of Kachin State. To date, most rare earth mining has been concentrated around Chipwe and Pangwa – a region close to the China border, 125 km north-east of the Kachin State capital, Myitkyina. Analysis of rare earth mining in the Chipwe/Pangwa region presented in this briefing paper series is based on a set of 80 interviews conducted in May 2023. Most of these interviews were conducted across Myitkyina and Waingmaw Townships with mine workers that had returned to their hometowns Myitkyina and Waingmaw from working in rare earth mining areas, as well as with residents, researchers, and civil society organisations from Chipwe and Pangwa during times when they were in Waingmaw and Myitkyina. Armed conflict, the risks associated with travel, and the strict security surrounding mining areas prevented extended fieldwork in the Chipwe/Pangwa area, although the dataset also includes interviews from these areas and direct observations of rare earth mining sites written by the research team.

Rare earth mining is also taking place in parts of Bhamo District, concentrated in Nhkawng Pa, a mountainous along the China border northwest of the border town of Mai Ja Yang. At the time of the research mining companies had also started to set up compounds in several other sites south of Bhamo town centred around the villages of Ding Sing Pa and Nba Pa, although at the time of this research mining had not yet started in these areas. Analysis of rare earth mining in Bhamo District presented in these Briefing Papers is based on a set of more than 40 interviews conducted in April 2023 across active and planned mining sites, as well as direct observations written up by the research team.

How data is presented in the papers

To mitigate the risks associated with publishing this research, the briefing papers do not include specific references to key informant interviews, such as the identities of the interviewees or the locations where the interviews took place. When direct quotations are included in the briefing papers, broad contextual information is provided to clarify the perspective being presented.

Currency rates

The Myanmar currency (Myanmar kyat or MMK) has depreciated significantly since the February 2021 military coup. By June 2024, the currency had seen a decline in value against the US dollar by more than 300% from around 1,300MMK to the dollar in February 2021 to around 4,000MMK to the dollar. The figures in this paper given in Myanmar Kyat and Chinese yuan (RMB) are those provided by the people we interviewed for this research in 2023. The conversions into US dollar are to provide readers with an estimated value and are calculated using the exchange rate of the time of the research (April-May 2023). This paper uses the following conversion rates.

RMB	MMK	USD
1	303	0.144
6.92	2095	1

Suggested citation:

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Contents

Photographs

The Rare Earth Mining Process in Myanmar: Labour practices and working conditions

This Briefing Paper explains labour practices and working conditions in rare earth mining areas in Kachin State, Myanmar. It documents in detail the kinds of jobs that that people do throughout the different stages of the rare earth mining process and the living and working conditions associated with these jobs. It also explains who administers and controls this workforce, as well as the impacts that labour migration has had on local areas. The research in this paper primarily focuses on the Chipwe and Pangwa areas of Kachin State, where most rare earth mining has taken place to date. It also includes insights into working conditions in Bhamo District, where a smaller amount of rare earth mining is currently occurring, but where mining activity is expected to grow in the coming years.

This Briefing Paper is part of a series explaining different aspects of the rare earth mining sector in northern Myanmar. It may be useful for readers first to look at *Briefing Paper 2: The Rare Earth Mining Process: From Extraction to Export* as this provides an overview of how the rare earth mining sector is governed – how companies obtain permissions to mine – and the technicalities of the mining process itself – how mining and preliminary processing are carried out.

Photograph 1: *Mining Site, Chipwe Township*

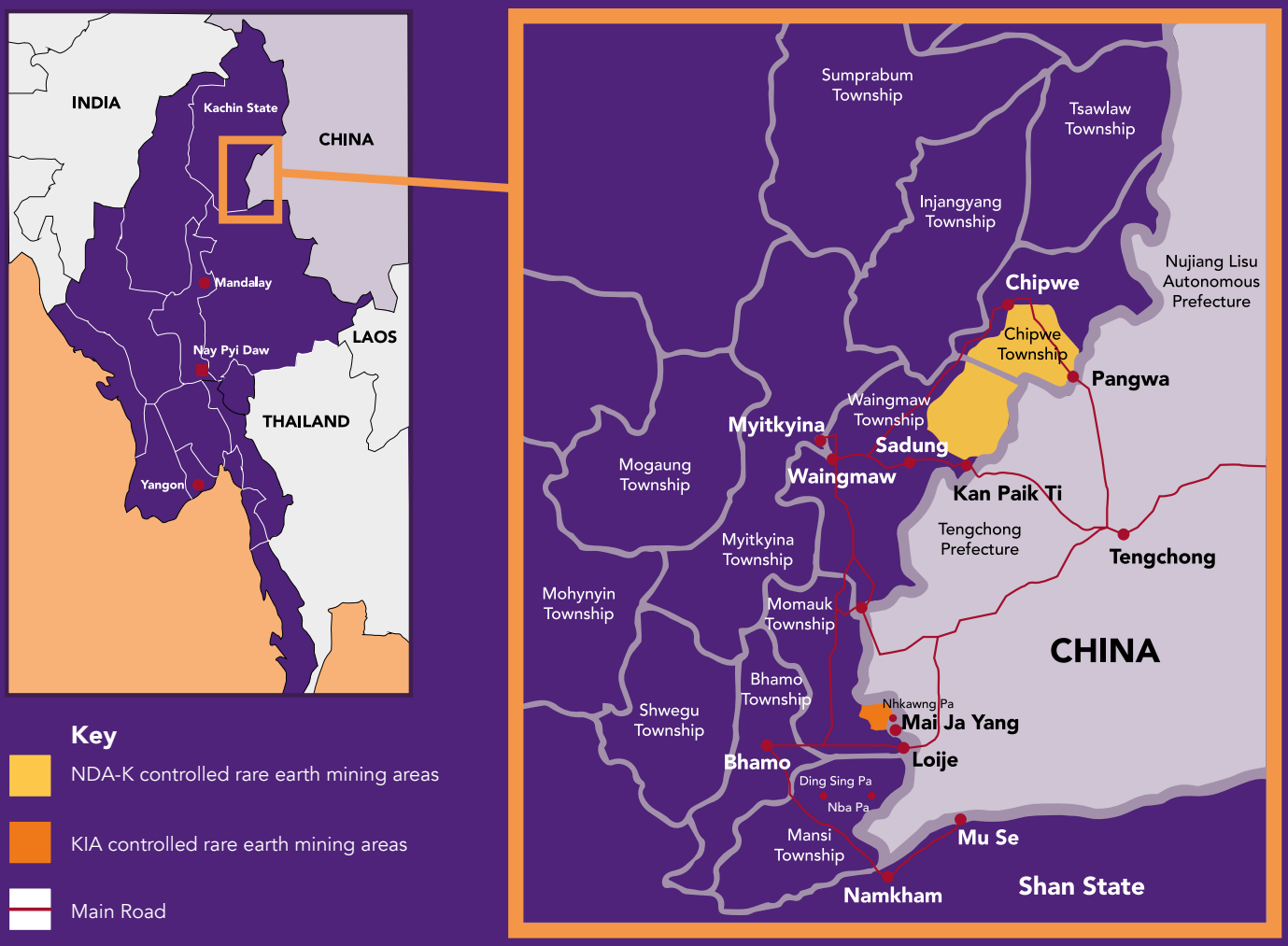


Figure 1: *Location of rare earth mining areas in Kachin State (Myanmar) adjacent to the border with China*

Overview of the rare earth mining sector in Myanmar

China has been the world's major source of rare earth elements (REE) for many decades. These metals are essential materials in many technologies, from mobile phones to electric cars, wind turbines and defence systems, and are central to the technology-led transition to a low carbon economy and net-zero carbon emissions. However, since around 2010 and particularly since 2016, the Chinese government started to impose stronger regulations over the REE sector to clamp down on unregulated, illegal mining sites and to improve environmental standards. At the same time, China has sought to maintain its strategic position as a key player in REE supply chains and production. Expanding the importation of raw REEs and feeding these into China's existing production of refined rare earth products has enabled this. It is in this context that Myanmar has risen to become one of the world's largest suppliers of heavy rare earth elements, with all production exported to China.

Rare earth mining in Myanmar is concentrated in regions of Kachin State close to the border with China (see Figure 1). Most rare earth mining is concentrated in a region of northeast Kachin State centred on Chipwe and the border town of Pangwa. This region is approximately 125 km north-east of the Kachin State capital, Myitkyina.

This area is under the control of a militia, known as the New Democratic Army-Kachin (NDA-K), which is closely aligned with the Myanmar Army. All rare earths mined in this area are exported to China via two important border crossings at Pangwa and Kan Paik Ti that are jointly controlled by the Myanmar Army and the NDA-K.

A smaller amount of rare earth mining has also taken place in Nhkawng Pa, a mountainous region of Bhamo District along the China border northwest of the border town of Mai Ja Yang. These mining sites are under the control of the Kachin Independence Organisation (KIO), which has fought a long-running war against the Myanmar Army since the early 1960s (although a ceasefire was in place from 1994 to 2011). All rare earths from this region are exported to China via border crossings controlled by the KIO at Mai Ja Yang.

The rare earth mining sector operates in similar ways in these different contexts, although there are important variations, especially in how companies obtain permissions to mine and the relationships between authorities and local populations. For further information on the NDA-K and KIO, please refer to *Briefing Paper 1. Rare Earth Mining in Myanmar: A Primer.*

What is the size of the workforce in rare earth mining areas, who comes to work in these areas, and why?

The rapid expansion of rare earth mining in the Pangwa/Chipwe area of Kachin State since around 2015 created a high demand for labour and led to large numbers of workers from within Myanmar moving to remote mining areas.

Prior to the Covid-19 outbreak, local authorities and labourers estimated that there were approximately 20,000 migrant workers in Chipwe and Pangwa at any one time, more than doubling the population of these communities (compared with the numbers recorded in the 2014 national census).[ii]

In contrast, labour migration into Bhamo District has been much smaller to date, due to the more limited scale of mining there, with an estimated 1,000 migrant workers present in mining areas. However, this looks likely to change in the coming years, as there are signs that mining operations will soon expand into new areas in Bhamo District.

The mining sector was disrupted by the Covid-19 pandemic, which led China to close some of its borders with Myanmar and saw local authorities in mining areas impose restrictions on people moving into these areas in search of work.

However, there has been a significant expansion in the scale of rare earth mining since the February 2021 military coup (see Briefing Paper 1 for data and analysis on recent trends in the scale of rare earth extraction).

The number of migrant workers coming in search of jobs has also risen significantly since the coup.

However, there are challenges in conducting quantitative surveys in remote and active conflict areas controlled by armed organisations, which have little interest in accommodating observers from civil society. This means that it is hard to calculate the exact number of workers now employed in the rare earth mining sector. Such calculations are made even harder by the transient nature of the workforce, with people moving to work in mining areas for a few months before heading back to their hometowns.

Rare earth mining has provided significant job opportunities for local people in remote areas close to the China border, where few other employment options exist. Those that can speak some Chinese have been able to secure better paid jobs as translators and labour brokers for mining companies. Considering the small size of local populations in remote areas and the demand for workers created by the mining boom, most of the workforce comes from outside the mining areas. As noted above, most people in search of work have travelled to the Chipwe and Pangwa region where the rare earth mining sector is much larger and well-established. Most labourers are Kachin and Shan people who come from other parts of Kachin State, such as Myitkyina, Waingmaw, Hpakant, Mogaung, Bhamo and Moemauk. In Chipwe and Pangwa, some migrant workers have come from other parts of Myanmar, notably from Sagaing Region and Rakhine State. Some of these people first travelled to Kachin State in search of work in the jade mines in Hpakant before then seeking other jobs.

Photograph 2: *Drilling pipes into the hillside. Some mining work takes place around the clock with workers divided into day and night shifts*

People coming in search of work in the rare earth mining sector around Chipwe and Pangwa from other parts of Myanmar often have greater difficulty accessing worker permits (see below) and passing through local security checkpoints than those whose ID cards register them as from Kachin State. This is due to the restrictions imposed by the NDA-K on people entering areas under their control. This situation is quite different from other sectors of the local economy in Kachin State, such as banana plantations, where companies have employed labour brokers to bring workers from other parts of Myanmar because they are seen as cheaper and more compliant than local workers, who may have connections to media and civil society organisations, and armed organisations[iii].

Most of those working in mining areas do so on a temporary basis, typically working for a few months before returning to their hometowns. This is partly due to the remoteness of mining sites, which requires them to be away from their homes and families. Additionally, many labourers take up mining work during quieter periods of the farming cycle, balancing wage labour with maintaining their smallholdings.

Despite the difficult working conditions in rare earth mining areas (see below), the opportunity of paid work is a big draw for people in a context where very few economic opportunities exist, and people struggle to make a living. Indeed, our research shows that the demand for jobs is so high that people often pay labour brokers to secure employment with a mining company.

In 2023, labour brokers usually charged around 200,000-300,000 Myanmar Kyat (MMK) (approximately US$95-143) although in some cases workers reported paying as much as 1 million MMK (approximately US$477) to secure a job. However, this informal system is open to abuse. As one mine worker from Myitkyina, explained, *"some brokers assure workers that they can get them a job, tell them how much money it will cost, and take the brokerage fees. But when the workers arrive in Pangwa, brokers cut off contact and run away. So, some workers were stranded in Pangwa without jobs. In the end, there were many people who had to return home and even had to ask someone to come to collect them".*

Most people who come to work in mining areas are young and middle-aged people between the ages of 15 and 50, and most are men, although – as we show in this briefing paper – women also work in mining areas. Our interviews with mine workers showed that they came from a wide variety of backgrounds and had various motivations for choosing to seek employment in rare earth mining areas. Some came in the hope of earning money quickly to pay off debts or in response to family difficulties such as unexpected medical costs. Others had lost their livelihoods in farming due to debt, displacement, or land dispossession. Indeed, many mine workers across both Pangwa/Chipwe area and Bhamo District were internally displaced persons (IDPs) who had been displaced due to the renewed armed conflict between the Myanmar Army and the Kachin Independence Army (KIA) after 2011.[iv]

Many of these motivations to seek work in mining areas existed before the COVID-19 pandemic and the February 2021 military coup but have intensified since the coup due to worsening economic hardship and increasing armed conflict. Economic opportunities have declined following the impacts of the Covid-19 pandemic and the coup. According to the World Bank, the size of Myanmar economy is now 10% lower than it was in 2019[v], while UNDP estimates that almost half of the country's population now live below the national poverty line – double the number in 2017 – and one-third of the population require humanitarian assistance.[vi] Inflation has accelerated significantly in the years since the coup, with consumer price inflation jumping 26.5% in the 2023/2024 fiscal year, driven by steep rises in food and fuel prices.[vii] In a country where public services were already very limited following decades of underinvestment, spending on education and health has halved since the coup to around 2% of GDP. As a share of the total budget, spending on health and education has fallen from 12.6% to 9.1%, while defence spending has jumped from 10% to 17% on defence.[viii] Average spending on health and education for East Asia and Pacific region is more than 4 times this figure.

The rising cost of living, declining employment opportunities in other sectors of the economy, and the lack of any kind of social welfare safety net helps to explain why the flow of migrant workers into mining areas has grown in recent years.

Heightened levels of conflict throughout Kachin State since the 2021 military coup has also meant that the number of IDPs seeking work in mining areas has increased. Some mine workers are also former government employees who joined the Civil Disobedience Movement and refused to work for the military regime which took power in the coup. Young people who dropped out of government-run schools and universities in opposition to military dictatorship have also migrated to mining areas in search of jobs.

Workers who come in search of jobs in rare earth mining areas rather than in the jade mines in Hpakant stated that this was because the rare earth sector offers a more reliable source of income. In the jade mines the amount of money a worker makes is dependent on finding good quality stones. Most labourers begin as 'jade scavengers', sifting through piles of mine waste extracted by equipment used by large companies. This work is dangerous – waste piles are prone to sudden landslides – and very poorly paid, but workers live in the hope of 'striking it rich' by finding a stone amidst the rubble.[x] In contrast, work in the rare earth sector does not offer scope for sudden enrichment but it does provide a steadier and more secure wage, albeit with other possible risks to health.

Since the coup, many families have faced worsening economic hardship, and this has led more people to seek wage labour to supplement family incomes. Workers reported that wage levels have fallen since the coup as mining companies have found they can still secure the required labour even when paying workers less.

It is common for people to work in the mining areas for a few months before returning home, only to come back again later. Many of these labourers are from farming households and typically work in the mines during the winter after harvest time. This pattern is also influenced by the tough conditions in mining areas (described in further detail below), where jobs are located in remote regions with few amenities, rudimentary accommodation, and many complain about the food provided.

Administration and control of labourers: Worker permits and checkpoints

Administration in Chipwe and Pangwa

All workers travelling into NDA-K controlled areas are officially required to have a work permit issued by the NDA-K to work in mining areas. The work permit takes the form of an ID card that workers are expected to keep with them to demonstrate their 'right to work'. These permits are valid for a certain period (ranging from a few months to a year) and workers returning to mining areas can use the same permit within this timeframe rather than applying for a new one each time they come.

Prior to the 2021 military coup, the Myanmar government had established some administrative offices in Chipwe. However, the NDA-K remains the de facto authority throughout this region. It operates the main checkpoints into mining areas and has taken the lead role in monitoring and policing migrant workers. It is the NDA-K that administers work permits in this area.

The cost of worker permits has fluctuated over the years but is in the region of 100-300 RMB (approximately US$14.5-US$43.5). Chinese currency, rather than the Myanmar kyat, is used predominantly in this region as it is seen as more stable and secure, and most goods in the local economy are traded with China. Companies will sometimes manage the permit process for labourers that they recruit directly to work for them. This system can be easier for the labourers but is also open to abuse. Numerous miners reported that some companies retained their ID cards to ensure that they did not leave, even if working conditions were bad or pay was less than initially agreed. Most labourers obtain the permit themselves in Chipwe or Pangwa. They provide their Myanmar ID card and then wait for between two days and one week for the authorities to process their worker permit. Typically, the companies which operate the mines deal directly with government administrators to register employees coming from China, such as site managers and technicians and then provide each worker with the necessary permit.

Between Chipwe town and the main mining sites across Pangwa, there is an important checkpoint, known as the Four Mile Gate. This gate is controlled by NDA-K armed militiamen, who check workers' permits and retain records of all workers in mining areas. Workers who do not have the necessary permit are sent back to the local administration office in Pangwa. Mine workers reported that those without permits were sometimes detained, beaten, and fined by the checkpoint militiamen. During the Covid-19 pandemic, workers were also required to pay 10,000 MMK (approximately US$4.8) for a Covid test at this checkpoint.

In this way, the NDA-K has maintained a tight hold over the flows of migrant workers. The NDA-K's determination to monitor workers seems to be linked to security concerns. In 2012, there were clashes between the NDA-K and the KIA following the KIA's efforts to capture Pangwa in a move that was supported by some people in the local area. Since then, the NDA-K has been wary of who moves into areas under its control.

Some workers try to enter mining areas without paying for permits by bypassing the main checkpoints. However, those without permits face several risks. Local NDA-K authorities sporadically go to mining sites to check workers' permits. In this situation, workers faced a choice between going into hiding in surrounding forests and facing the risk of losing their wages or being punished or fined by the militia.

It is also the case that having a permit provides workers with a small degree of bargaining power with the companies employing them. In some instances, where companies failed to pay their workers, those with permits were able to raise complaints with local authorities to try to pressure companies to pay them their wages.

After the military coup, due to the arrival of large numbers of people in search of work, the permit process was tightened and the level of security at checkpoints was increased. Local accounts reported that militias linked to the NDA-K have established further checkpoints of their own and in some cases now charged workers money to enter mining areas. At one such checkpoint, the local militia charged people from Pangwa Township around 300 RMB (US$43) to enter mining areas, with outsiders charged double this fee. As above, this appears to be linked to longstanding security concerns and the NDA-K's efforts carefully to monitor who enters their area.

Overall, the NDA-K has focused its attention on monitoring and policing labour, rather than addressing other issues such as ill-treatment of workers by companies, the environmental damage caused by mining companies, or tackling issues related to gambling and drugs in mining areas.

Photograph 3: *Rare earth collection tanks, Bhamo District, 2023.*

Administration in Bhamo District

Administration of workers in KIO-controlled mining areas has, to date, been less formalised. This is because the size of the mining sector in these areas to date has been so much smaller, meaning the demand for labourers and the scale of inward migration has been far smaller. As noted above, rare earth mining in Bhamo District is estimated to employ only around 1,000 people at any given time and most workers come from nearby areas. Migrants do need to pass through KIO-controlled checkpoints but they are not required to obtain a worker card and face less scrutiny compared to mining areas under NDA-K control. In the Nhkawng Pa area, mining areas are close to villages and workers stayed in these villages.

Box 1: How are rare earths extracted?

All REE extraction in northern Myanmar is carried out through a process known as in situ leaching. This is the same process that has been used extensively in southern China to extract heavy rare earth elements. This process first involves inserting hundreds of pipes into the hillsides to create a network of boreholes. A leaching agent – most commonly ammonium chloride or ammonium sulphate dissolved in water – is then gradually dripped into the hillside over several months through these pipes to dissolve rare earth elements that are present in clay minerals within the hillside.

The leaching agent moves down through the clay under gravity, with distribution of the agent aided by mixing with large volumes of additional water pumped into the deposit through pipes inserted further down the hillside, dissolving the rare earths present in the clay as it goes. Additional water is pumped through to ensure the leaching agent contacts as much of the clay deposit as possible, increasing the extraction of rare earths.

The solution bearing the dissolved rare earth elements (called leachate) is then washed out to the surface further down the hillside through a network of recovery tunnels. The rare earth solution is collected in large collection tanks built at the bottom of the hillside. For large hillsides, this entire process will typically be repeated three times, creating three different layers of collection tanks, each layer moving further down the hillside.

Labourers add chemicals to the tanks to precipitate the dissolved rare earths as a solid sediment that settles to the bottom of the tank. Once the sediment is settled, most of the water is drained from the tank and workers manually dig out the sediment sludge and place it into containers. It is then transferred to a different site and burnt in large furnaces for 48 to 72 hours. For each three or four sacks of sludge, one sack of dry rare earth oxides (known as mineral 'dust') is produced. The dry dust is then packaged in sacks for export to China for further refining. Depending on the size of the hillside, the extraction of rare earths can take six months to one year, after which the company will move to a new site.

Further detail on this is provided in *Briefing Paper 2: The Rare Earth Mining Process in Myanmar: From Extraction to Export.*

Types of jobs in the rare earth mining sector

This section explains the different types of jobs in the rare earth mining sector, with a summary table (Table 1) provided at the end. The vast majority of workers in rare earth mining areas are men, although women are employed in some roles, notably as 'water watchers' and cooks (see below).

Company bosses, technicians, and site managers

Company bosses and technicians in mining areas where we conducted research were Chinese men, and most were from Jiangxi Province in Southeast China. Jiangxi has a long history of heavy rare earth mining using in situ leaching, although many mines were shut down after 2016 when the Chinese government sought to clamp down on illegal, unregulated and environmentally damaging mining activity. As a result of increasing control by the Chinese authorities in Jiangxi, many companies sought new opportunities to continue to supply the Chinese market with heavy rare earths, by moving their operations to northern Myanmar, bringing with them technicians and machinery previously deployed across Jiangxi.

Mining companies employ a site manager for each mining site, who is responsible for overseeing all aspects of the mining process. This includes managing relations with local authorities, nearby populations, and workers – including managing their wages – and ensuring the mine operates effectively. Companies also deploy several technicians to each mining site. They are responsible for overseeing prospecting activities and assessing the results of initial prospecting, deciding where to locate mining sites, operating and fixing key machinery (especially water pumps), overseeing the leaching process to ensure the correct amounts of chemicals and water are used, and advising on where to situate recovery wells and collection tanks. Site managers are typically people from the local area who can speak Chinese, enabling them to liaise between companies, workers and local communities. Some initially worked as translators for company bosses before taking on the role of site manager.

Technicians and site managers are employed directly by mining companies and are the best-paid jobs within the rare earth mining sector. One of the first actions that takes place at new mining sites is the construction of accommodation for site managers and technicians, which is of better standard than the dormitory blocks and tents where other workers stay.

Labourers

Companies employ local labourers to undertake various manual jobs. Broadly, labourers can be divided into those who are directly employed by mining companies, and those who effectively operate as informal contractors. Those employed directly by companies are often referred to as 'general workers' and are paid a regular salary based on the hours/days they work. Those who work independently are described locally as 'daily labourers' and are paid by the company depending on the extent of the work they complete. They are typically paid periodically once a job is completed, rather than at the end of each day, but this pay is calculated according to how much work they complete (for example, how many pipes they lay).

The company provides accommodation and food for general workers (although these costs are subtracted from their wages), while daily labourers must manage these requirements by themselves. It is important to note that daily labourers are usually managed by a local labour broker/foreman who takes a cut of what they are paid by the company in return for having secured them work and for managing relations with the company. This system is explained in more detail below.

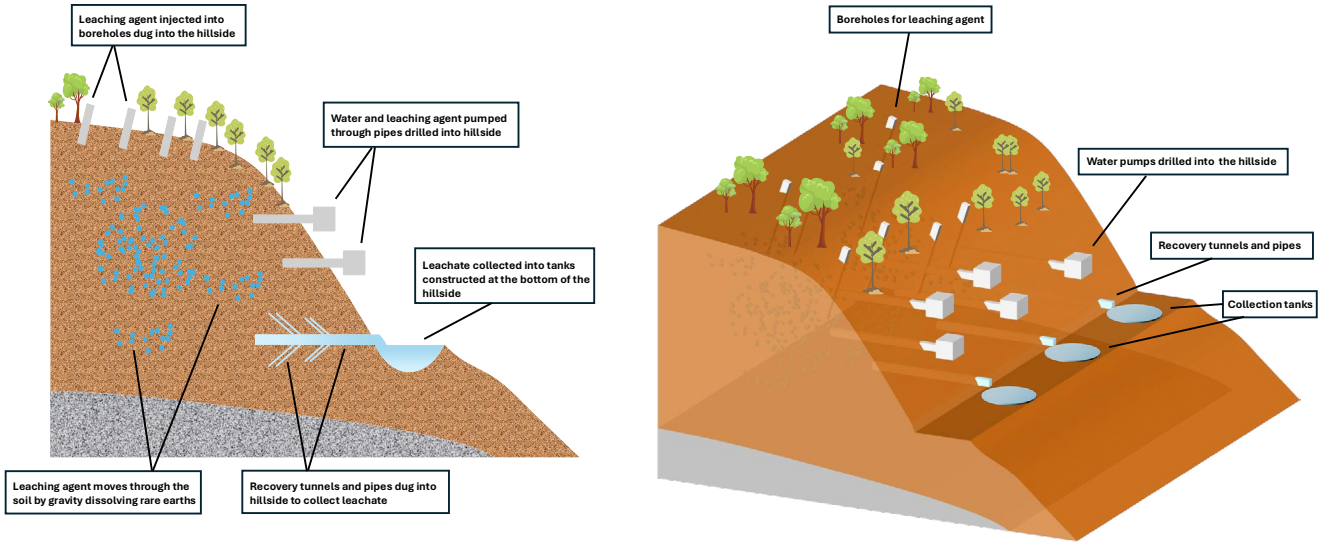
General workers and daily labourers undertake various activities in mining areas. These are detailed below according to the different stages of the rare earth mining process in Myanmar. This section focuses on the specific roles and working conditions in the sector. The social and environmental impacts of the mining processes will be covered in further briefing papers in this series.

Prospecting for rare earths

Once a company has gained the necessary licences from local authorities, the first job is to prospect for rare earth deposits across the concession area. Companies deploy teams of workers to carry out prospecting activities, usually from within the existing ranks of workers that they have hired. These workers are divided into teams of two and are dispatched across the concession area, where they are tasked with collecting soil samples from a depth of three metres. The workers must then mix this soil with a chemical solution that the company provides to them. If the soil turns the chemical solution a milky white, then the soil has a high concentration of rare earth elements.

Prospecting for rare earths is one of the safest jobs, but it is only a short-term job. In the early years of the mining boom up to around 2018/19, companies would pay these workers 500 RMB/day ($US72/day). As more people came to work in mining areas and competition for jobs increased, wages fell to 100-200 RMB/day (US$14.5-US$29).

Figure 2: *In-situ leaching*



Borehole pipe-digging

Once the company has decided where to extract rare earths, the next step is to construct a network of pipes in boreholes at the top of the hillside, through which leaching agent is dripped once the rest of the mining site has been constructed. Digging of the boreholes into which pipes are placed is labour-intensive and is the part of the mining process that employs the most people (see Figure 2, below). This kind of work is suited to seasonal labourers who are seeking work for two to three months. It is arduous work, and most pipe diggers are young men. Companies do not employ hole diggers directly as salaried workers but pay these workers depending on the length of pipes inserted into the holes on the hillside. The site manager manages relations with these workers and takes a cut of their wages in return for providing them with food and accommodation.

Once the network of boreholes is completed, the company pays money for the workers' wages to the site manager. According to our research, companies typically pay the site manager around 8-10 RMB (US$1.10-1.40) per metre of iron pipe inserted into the hillside. Of this, the foreman keeps at least one-third, around 3 RMB/metre (US$0.40) and pays workers 5 RMB/metre (US$0.70). Workers must keep a record of the number of boreholes they have dug by marking their holes with their worker ID number.

According to the mine workers we interviewed, borehole pipe-digging can be quite lucrative, and workers can earn as much as 300 RMB/day ($US43). However, not all this money is profit as pipe diggers must invest in equipment and pay the site manager for certain costs.

Pipe diggers must buy their own iron pipes, which cost about 15 RMB (US$2.20) per metre. They must also buy a piece of equipment, known locally as a 'htungzi', which is used to drive the pipes into the ground and costs around 100-150 RMB ($14-22) (see Figure 3). Once mining is completed at a site, the iron pipes can be recovered and re-used at the next mining site. However, this system means that pipe diggers typically need to invest about 500 RMB (US$72) upfront before they can start work. Few workers have this money and will often borrow it from the site manager, who then subtracts this loan from the money that they subsequently pay to workers. Once workers get paid, they will use some of their earnings to buy more iron pipes.

As these workers are not employed directly by the company, none of their basic needs are covered by the company. Workers must pay the site manager about 35 RMB/day (US$5) for their meals. They must also buy whatever else they need to live for extended periods of time in remote mining areas, for example poles and canvas to build tents, basic toiletries such as toothpaste and soap, and coffee and cigarettes. They buy these products from the mining company or the site manager, who will often provide an advance before recouping this money from the wages due to workers. Furthermore, because they are self-employed, companies do not take responsibility for these workers if they get injured, and they must continue to pay the site manager for their meals even if they are sick or injured and unable to work.

Miners recounted some instances where site managers had absconded with funds provided by companies for paying workers' wages. They also described situations where disputes arose between workers and site managers regarding the measurement of pipes, leading to disagreements over wages owed. In other cases, disputes arose between workers, with some labelling the holes dug by others with their own worker ID numbers. Despite these challenges, the workers we interviewed considered hole digging to be quite an economically rewarding job which enabled them to save significant sums of money to take home with them.

Photograph 7: *Local store selling equipment required for digging boreholes. The 'Htungzi' can be seen at the forefront. Chipwe/Pangwa, 2023.*

‘Water watchers’: Adding the leaching agent

Once the rest of the mining site has been constructed (see steps below), companies employ workers to add the leaching agent into each of the pipes in the holes dug into the top of the hillside. This agent (a combination of water and chemicals, usually ammonium chloride or ammonium sulphate) is added gradually to the boreholes over at least a month and sometimes several months. The people who undertake this work are known colloquially as ‘water watchers’. They are employed directly by companies, and this is one of the few jobs in the sector where both women and men are employed.

This is partly because water-watching is considered a very dull job by men, who often prefer more active, physical roles, leaving some of these jobs for women. Companies are willing to employ women for these roles because they perceive women as less likely to drink alcohol, which could interfere with the concentration and precision needed for this role.

Water watchers work in small teams and must continue to drip the leaching agent into the boreholes around the clock. The work is divided into day and night shifts. Water watchers are paid around 3,500-4,000 RMB (approximately US$506-$578) per month.

Photograph 6: *Water watchers add leaching agent into networks of pipes. Chipwe/Pangwa, 2023.*

Well drilling and water-pumping

Further down the hillside, the next step in the mining process is to construct a network of pipes through which large amounts of water are pumped to mix with and dilute the leaching agent, to make a leaching solution that is effectively distributed throughout the clay deposit. This is a more technical job that requires drilling machinery and is directly overseen by technicians working for the company. The first step is to drill holes into the hillside and to install the pipe network. Two-metre-long iron pipes are drilled into the side of the hill and are welded together until the designated depth is reached. This part of the work is dangerous, with miners reporting serious injuries from the drilling machinery. However, if workers get hurt in this role, the company takes responsibility for their treatment and compensation as these workers are directly employed by the company.

Water is pumped from nearby rivers and streams and then pumped into the clay deposit via the pipes for several months to distribute the leaching agent throughout the deposit in the form of a more dilute leaching solution. The company directly employs workers for this role, who are also known as 'water watchers'. Again, this is a twenty-four-hour job, divided into day and night shifts. The water usage also significantly depletes water sources in the nearby rivers and streams. These workers reported being paid in the region of 3,500-4,000 RMB/month (US$506-$578).

This is a meticulous job since the water pumped into the hillside loosens the soil and if too much is added at one time it heightens the risk of landslides (see Box 1). When landslides occur, the water watchers are sometimes blamed and are fired from their jobs because they are viewed as responsible for allowing too much leaching solution to have been pumped into the hillside and for causing damage and loss of life and equipment.

After several months, the company will check whether rare earths remain in the deposit by tasking workers to add leaching agent to the water. If the water that drains from the deposit in the recovery tunnels is a milky white colour then it means that the clay deposit still contains significant concentrations of rare earths. If the water is clear, then the rare earths originally present in the deposit have been removed.

Box 2: Landslides in rare earth mining areas

Landslides are a common occurrence in rare earth mining areas and are one of the greatest threats facing workers. Landslides appear to be caused by a combination of factors. Firstly, rare earth mining is carried out on steep slopes since much of the process relies on gravity for the leaching agent to travel through the soil. Secondly, large volumes of leaching solution are pumped into the hillside to wash through the rare earth sediments and this process loosens the earth. Thirdly, trees and shrubs are typically removed from hillsides to make mining sites easier to navigate and to provide a source of firewood and construction material. This means there are fewer roots to anchor the soil in place and the soil becomes saturated more easily. Fourthly, companies do not undertake risk assessments (such as geological surveys, slope stability analysis, or hydrological or soil testing) to evaluate the potential for landslide occurrence.

Miners interviewed for this research reported that landslides had killed and injured many workers over the years, although there is no publicly available data on the incidence of landslides or the numbers killed. The risk of landslides is highest during the rainy season (May to August).

Growing media attention to rare earth mining has meant that such disasters are now starting to be reported. In June 2024, Kachin media reported two major landslides in the Pangwa area. The first landslide, which occurred on 4th June, killed more than twenty people.[xi] A second landslide on 19th June left more than fifty miners missing with most presumed dead.[xii] Smaller landslides in the area in late May had also killed several workers.[xiii]

Digging leachate recovery tunnels

At the bottom of the hillside, the final step of mine construction is to build a series of recovery tunnels. These tunnels are used to collect the leachate (the leaching solution that has passed through the clay deposit and dissolved the rare earths which are contained in the clay minerals). The first step is to drill a series of large tunnels into the base of the hillside. These tunnels can be 100-150 metres long and 2 metres in diameter and are drilled about 30 metres apart. Once workers have used machinery to drill the main tunnel, they then dig smaller secondary tunnels. The leaching solution (comprising the leaching agent dripped in at the top of the hill and water pumped into the deposit) spreads throughout the deposit and then gradually drains down to the recovery tunnels under gravity.

Tunnel diggers are not employed directly by the company, and they must provide their own equipment and fuel. However, these workers reported that companies did provide them with basic accommodation. These workers estimated that in a single month a small team of 4-6 workers could dig approximately two 100 metre tunnels. The company pays each worker 130RMB per metre ($US18.80) providing a gross monthly income of about 26,000RMB or US$3,757. However, the monthly expenses that workers incur on equipment, fuel and basic living costs are also high, with workers estimating that that these costs could be as high as 18,500-20,000RMB (US$2,673- US$2,890). This would leave a monthly income of $US867-US$1,084.

This work entails significant risks from tunnel collapse when working inside the tunnels. Tunnel collapse can also increase the risk of landslides. Workers reported that these dangers were exacerbated by the fact that higher up the hillside the company would often get workers to start adding the leaching agent and pump water through the soil before they had finished constructing the tunnels. This greatly heightened the risk of tunnels collapsing. It also meant tunnel diggers risked losing income because if part of the hillside collapsed and buried the tunnels that they had already dug, the company did not pay them for this work because the length of the tunnels could no longer be measured.

Photograph 7: *A technician oversees the drilling of pipes into the hillside. Leaching solution will then be pumped through these pipes. Chipwe/Pangwa, 2023*

Constructing collection tanks and digging out rare earth sediment

Mining companies employ "general workers" (see below) to dig large collection tanks at the bottom of the hillside. The leachate containing dissolved rare earths flows into these collection tanks from the recovery tunnels. Workers add chemicals to these pools which, after several days, precipitates the dissolved rare earths as a solid white-grey sediment that settles to the bottom of the tank as a sludge. Workers must then dig the sediment sludge out of collection tanks into sacks, in which the sludge is transferred to furnaces for further processing. The main risk to workers at this stage relates to the handling and use of chemicals, as the workers have no knowledge of the chemicals that are used and will typically undertake this work with only basic protective clothing.

Photograph 8: *Construction of collection tanks. Chipwe/Pangwa, 2023.*

Photograph 9: *A worker tests the leachate in the collection pools to measure the concentrate of rare earths. Chipwe/Pangwa, 2023.*

Photograph 10: *Workers prepare to dig out the rare earth sediment from collection pools. Chipwe/Pangwa, 2023.*

Burning rare earth elements

The final stage of the rare earth extraction process is to burn the sediment sludge. This takes place in large furnaces, converting three or four sacks of wet sediment sludge into one sack of dry rare earth oxides (known as dust). The dust is then packed into heavy-duty sacks, which are exported to China for further refining.

Workers operating the furnaces are employed directly by the mining companies. The company first employs general workers to build the furnace compound, which usually houses eight to twelve separate furnaces. Some companies operate their own furnaces; others pay to use furnaces operated by larger companies. The workers must also amass large stockpiles of firewood.

Once the furnaces are operational, the company employs workers to transfer the sediment sludge to clay pots (about 30 cm in diameter) and load them into the furnace. Each furnace typically holds between one thousand and two thousand pots. The sediment sludge is then burnt for between 48 and 72 hours until it produces a dark brown dust (comprising a mixture of different rare earth oxides). The clay pots, which are imported from China, can be used twice, after which they are then broken up and discarded on a rubbish site close to the furnaces.

Photograph 11: *Rare earth sediment being prepared for burning in the furnaces. Chipwe/Pangwa, 2023.*

The labourers operating the furnaces typically work in teams of four or five so that they can keep the fires burning constantly. The workers are told only to start the burning process once the trucks are scheduled on site in case of delays along the roads to mining sites. These are the trucks that will subsequently transport the sacks of dust to the China border. They receive their wages once the sacks have been loaded on to the trucks.

Workers in charge of operating the furnaces face several risks, the principal one is the risk to health from inhaling gases, fumes and fine particles produced by the furnaces. Companies pay these workers slightly more than those in other jobs, seemingly due to these risks. Local workers reported that Chinese managerial staff never come to the burning sites when the furnaces are operational, and companies never employ workers for more than a year in this role. Some miners reported negative health effects, such as nose bleeds and headaches, but had no knowledge of the exact cause of these or whether they would face long-term side effects. Operating the furnaces also poses challenges. Some furnaces are constructed in such a way that the firewood must be continually thrown into the fires, which can be dangerous. Workers also reported many cases where workers had accidentally damaged the furnaces when throwing in firewood, for which the company deducted money from their wages.

Photograph 12: *(Clockwise from top left): Labourers preparing rare earth sediment for burning; Transferring rare earth sediment to clay pots and into the wood-fired furnaces; Clay pots with rare earth sediment waitng to be burnt. Chipwe/Pangwa, 2023.*

Miscellaneous tasks

Alongside the specific roles highlighted above, companies employ workers to undertake various odd jobs as required around the mining sites. These include collecting firewood, carrying pipes and other equipment to different locations, building dormitory blocks and tents for workers, and transporting sediment sludge from the collection tanks to the burning sites. These jobs are undertaken by "general workers" who are directly employed by companies and are paid once per month at a rate of approximately 120 RMB (US$17) per day worked. Both general labourers and site managers keep a log-book to record the number of days worked. Some workers complained that the company did not pay them the full amount that they were owed because the site managers had not properly recorded their workdays. However, it was very difficult for them successfully to dispute these records.

Figure 3: *Jobs in the rare earth mining sector*

Type of job	Job Description	Employment status	People who are employed	Wages (in 2023)
Company bosses	Responsible for managing the company's activities in Myanmar	Employed directly by the company – usually within China before travelling to Myanmar	Chinese, mostly from Jiangxi Province, Southeast China	Unknown
Technicians	Responsible for overseeing prospecting and construction of mining sites and servicing machinery, especially water pumps	Employed directly by the company – usually within China before travelling to Myanmar	Chinese, mostly from Jiangxi Province, Southeast China	Unknown
Site managers	Responsible for overseeing on-site mining operations, including managing relations with local authorities and workers – including managing their wages	Employed directly by the company – usually locally within Kachin State	People from the local area who can speak Chinese	Unknown, includes bonuses for successful mining operations
Rare earth prospectors	Collection of soil samples from across concession areas	General workers recruited locally and employed directly by the company	People from the local area and labourers that migrate to mining areas	100-200RMB /day (US$14.5-US$29)
Borehole pipediggers	Construction of pipe networks through which leaching agent is dripped into the hillside	Casual labour. Workers are not employed directly by the company but are paid according to the length of pipes they lay	People from the local area and labourers that migrate to mining areas	Up to 300RMB/day (US$43) Labourers must cover their own equipment costs and pay the site manager for food and lodgings
'Waterwatchers'	Responsible for adding leaching agent into boreholes	General workers recruited locally and employed directly by the company	People from the local area and labourers who migrate to mining areas. Where mining companies recruit women as well as men, women are tasked with this job	Approximately 3,500-4,000 RMB/month (US$506-US$578)

Type of job	Job Description	Employment status	People who are employed	Wages (in 2023)
Well drillers	Responsible for drilling holes into the hillside through which leaching solution is pumped	Technicians employed directly by the company – usually within China before travelling to Myanmar	Technicians are Chinese, mostly from Jiangxi Province, Southeast China	Unknown
'Water watchers' for water pumping	Responsible for monitoring the volume of leaching solution pumped into the hillside	General workers recruited locally and employed directly by the company. Overseen by technicians	People from the local area and labourers that migrate to mining areas	Approximately 3,500-4,000 RMB/month (US$506-US$578)
Tunnel diggers	Digging large recovery tunnels that are used to collect the leachate and channel it to collection tanks	Casual labour. Workers are not employed directly by the company but are paid according to the length of tunnels they lay	People from the local area and labourers that migrate to mining areas	130RMB per metre ($US18) Labourers must cover their own tunnel-digging equipment, fuel and living costs. Income after these costs are deducted estimated at 6000- 7500RMB per month ($US867-US$1084)
Builders of collection tanks and digging out rare earth sediment	Responsible for digging tanks at the bottom of the hillside that collect the leachate, adding chemical to precipitate the rare earth sediment, and digging this out of the tanks	General workers recruited locally and employed directly by the company	People from the local area and labourers that migrate to mining areas	Approximately 3,500-4,000 RMB/month (US$506-US$578)
Furnace operators to burn rare earth elements	Responsible for transferring rare earth sediment into clay pots and burning these pots into furnaces for 48- 72 hours, before then transferring the rare earth oxides into sacks	General workers recruited locally and employed directly by the company	People from the local area and labourers that migrate to mining areas	Approximately 4,000-4,500 RMB/month (US$506-US$650)
General workers	Responsible for miscellaneous manual labour jobs on mining sites, such as building dormitory blocks, collecting firewood, moving equipment	General workers recruited locally and employed directly by the company	People from the local area and labourers that migrate to mining areas	Paid per month but only for the number of days they work at a rate of approximately 120RMB/day (US$17)

Job creation and wider linkages to the local economy

Rare earth mining generates further jobs in the local economy, not directly related to the mining companies. Examples include running guesthouses for workers, cutting firewood to sell to the company and providing taxi services for workers travelling to remote mining sites. In some cases, workers have also pooled money to hire their own cooks rather than pay for the food provided by the company, which many workers complained was Chinese food rather than local cuisine.

The inflow of large numbers of migrant workers into remote areas also creates a market for goods such as snacks, cigarettes, alcohol, toiletries and clothing. Most of these goods are imported from China and then sold by local shopkeepers. In some places, the company monopolises the sale of these items to workers by operating general stores at mining sites. Workers who are directly employed by the company can obtain items from these stores, with the costs deducted from their wages. However, in many areas local people have been able to make money by purchasing goods from towns to then sell to workers at remote mining sites.

Throughout mining areas, some businesspeople have also tried to make money by establishing small, local gambling houses,[xiv] selling drugs, and operating brothels. These activities can be lucrative in areas where wage labour means there is significant cash circulating in the local economy and where migrant workers, predominantly young men, are far from home and confined to remote areas where there is little to do outside of working hours. In Pangwa and Chipwe, workers reported that many of these illicit activities were run by the NDA-K militias or businesspeople with connections to local authorities and this meant there was little impetus to prevent or police these activities. The fact that there has not, as yet, been large-scale migration into mining areas controlled by the KIO in Bhamo District means that there has not been the same level of concern about these issues to date. The social impacts of these activities are addressed in further detail in Briefing Paper 4.

Labour practices and working conditions: Five key implications

1. **Wage labour in rare earth mining is key to many people's livelihoods but workers face many challenges due to poor working conditions:** Wage labour is an essential component of many households' livelihood strategies in Myanmar, even households who rely primarily on smallholder farming as their main livelihood. Wage labour has become even more important since the military coup due to the rising cost of living (due to shortages of goods and inflation) and the disruption to farming and agricultural markets caused by armed conflict. In this context, the rare earth mining sector has provided an important source of wage labour that has supported many households across Kachin State. However, workers in mining areas face many risks and vulnerabilities because of the lack of regulations, poor health and safety, and their weak bargaining position vis-à-vis labour brokers, mining companies, managers and local authorities. This has made it very hard for workers to challenge poor practices, especially since workers are concerned that companies will replace them if they raise concerns and there are limited alternative economic opportunities.

2. **Workers and local civil society have limited knowledge about the technical aspects of the mining process. Strengthening levels of education and knowledge about rare earth mining is vital for identifying ways to address the risks that workers face:** Workers and local civil society have very limited knowledge about the technical aspects of the mining process. This includes not knowing the types of chemicals used, the harms they pose, and how they can mitigate health risks. Providing further education and information to workers, such as through training offered by local CSOs, could be a practical first step in mitigating risks. This could include informing workers about basic protective equipment they should request from companies or consider purchasing themselves.

3. **Disputes surrounding wages and working conditions are common in mining sites. There is a need for stronger and non-violent local dispute resolution mechanisms for workers:** Large numbers of workers have moved into remote mining areas and disputes are common amongst workers, between workers and companies, and between workers, companies and local populations. A major challenge is that the pace of migration and subsequent expansion of populations in mining areas has outpaced the extension of civilian authority and regulation and basic service provision. This has created a demand for better monitoring and regulation, policing of remote mining sites in cases of violence or theft, and dispute resolution mechanisms between workers and employers. Local armed authorities have stepped in to provide this role in mining areas, reinforcing their longstanding role as key interlocutors between local populations and external actors (in this case mining companies). In doing so, they have reinforced their authority over local societies.

   This has been especially apparent in the Chipwe/Pangwa region where the NDA-K has taken the lead role in administering the large numbers of migrant workers that have moved into the area, for example by establishing worker registration cards and checkpoints. The NDA-K has also strengthened its role as the de facto local police force since there is no other local authority for people to turn to in cases of theft, violence, or poor treatment by companies, such as reneging on agreements over pay and conditions. For those willing and able to pay for its services, the NDA-K has provided a higher authority for people to seek redress for their grievances. This is captured in the reflections of one worker who had been employed in a mining area close to Pangwa,

   "We had to drink water that contained chemicals as our Chinese site manager did not buy pure drinking water. We reported this issue to the militia. We had to pay 1,500 yuan (c.US$210) for them to take action. After we reported the water issue, the militia came and beat him [the site manager]. After that he bought drinking water for us. However, in some cases, the workers cannot give enough money to the militia, or the Chinese bosses pay bribes, so then the authorities do not take action on complaints seriously".

   However, this approach has reinforced local systems of violent and militarised rule.

A key insight from this research is the need to find ways to support and strengthen non-violent dispute resolution mechanisms so that there is greater scope for workers to challenge harmful or exploitative practices without the need to resort to violent and militarised forms of dispute resolution. Addressing how to establish local regulatory frameworks around working practices (and what these frameworks should include), is an important first step. This approach also requires assessing which civil society organisations may be able to engage safely with local authorities and companies to manage disputes, and how these organisations can be supported and protected as they strive to establish non-violent dispute resolution mechanisms.

4. **Concerns about the harms caused by rare earth mining have focused on its environmental impacts and the impacts to local communities. Efforts to ensure companies adopt more responsible mining practices must also address issues related to working conditions:** Much of the focus on the harms caused by current mining practices concentrates on environmental impacts. However, there is also a need to focus on how to improve working practices and the challenges of doing this in a context where workers have little bargaining power vis-à-vis companies and local authorities, and companies may have few incentives to invest in safer working practices. A first step could be to encourage companies to provide appropriate personal protective equipment (PPE) and training on how to use it. Alongside worker safety, this approach could also be encouraged on the basis that reduced injuries and illness and higher worker availability supports more efficient and profitable operations. If the companies are unwilling to provide PPE, at least enabling workers to purchase/access PPE themselves – for example through facilitating CSOs to provide PPE or making this available in local shops – could be another way to mitigate harms. The same argument could be made to the workers themselves – their investment in PPE will reduce the number of days injured or ill and therefore the number of days where they are not being paid.

5. **Existing data on working practices and their health impacts is limited. Supporting further data collection on health risks posed by mining is vital to better understand the harms caused by current mining practices and how to mitigate these harms:** There is a need to generate credible and robust baseline data on the health impacts facing mine workers. Existing research has been able to detail current labour practices and has also highlighted the extent to which mine workers are concerned about the damage that rare earth mining may be causing to their health. However, the scope to understand these issues and to consider what could be done to mitigate adverse impacts of rare earth mining is significantly hampered by the lack of data on this issue. A first step could be to assess what local health data currently exists (such as that held by local clinics) and whether it is possible to access this data. Beyond this, an important next step would be to support CSOs and researchers to develop knowledge, skills and training to conduct research on health issues facing mine workers so that future work to mitigate health harms can be informed by stronger evidence base.

Endnotes

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[ii] This estimate of migrant workers was provided by local administrators and mine workers from Pangwa. Census data recorded the total population of Chipwe Township as 11,303 and Pangwa as 8,736 in 2014.

[iii] Meehan, P., & Dan, S. L. (2024). Drugs and extractivism: opium cultivation and drug use in the Myanmar-China borderlands. The Journal of Peasant Studies, 51(4), 922-959. Access here.

[v] The KIA is the largest armed organisation in Kachin State and has been fighting against the Myanmar state since the early 1960s. In 1994, it reached a ceasefire with the government that held for seventeen years. The ceasefire collapsed in 2011 and led to the resumption of large-scale armed conflict across large areas of Kachin State and northern Shan State. For more information on the KIA and the NDA-K, see Briefing Paper 1. For more information on the experiences of the KIA ceasefire and why it collapsed, see: Mandy Sadan (ed.). (2016). War and peace in the borderlands of Myanmar: The Kachin Ceasefire 1994-2011. Nias Press.

[v] World Bank. (2024). Myanmar Economic Monitor June 2024: Livelihoods under Threat. World Bank Group. Access here.

[vi] UN Development Programme. (2024). Poverty and the household economy of Myanmar: A disappearing middle class, p.5. Access here UN Office for the Coordination of Humanitarian Affairs. (2023). Myanmar Humanitarian Needs and Response Plan 2024. Access here.

[vii] World Bank. (2024). Myanmar Economic Monitor June 2024: Livelihoods under Threat. World Bank Group, p.2. Access here.

[viii] World Bank. (2024). Myanmar Economic Monitor June 2024: Livelihoods under Threat. World Bank Group, pp. 3, 37. Access here.

[ix] The Civil Disobedience Movement (CDM) emerged as a significant form of protest against the military coup that took place on February 1, 2021. The coup saw the Myanmar military take power from the democratically elected government of the National League for Democracy (NLD) party led by Aung San Suu Kyi, which had won the elections in 2020. The CDM began immediately after the coup, with its primary goal being the restoration of democracy. It aimed to disrupt the administrative machinery of the military regime by encouraging civil servants and workers from various sectors to stop working.

[x] Sadan, M., & Dan, S. L. (2021). The role of artisanal mining in the sustainable development of Myanmar's jadeite industry. Environmental Science & Policy, 126, 189-196; Sadan, M., Yü, D. S., & Dan, S. L. (2021). Researching Life Stories of the Myanmar-China Jadeite Trade. New Area Studies, 2(1). Access here. Prasse-Freeman, E. (2022). Necroeconomics: dispossession, extraction, and indispensable/expendable laborers in contemporary Myanmar. The Journal of Peasant Studies, 49(7), 1466-1496. Access here.

[xi] Radio Free Asia. (2024, 6th June). Five dead, 20 missing in Myanmar landslide. Access here.

[xii] Burma News International. (2024, 21st June). About 50 Miners Missing After Rare-Earth Mine Collapse in Pang War. Access here.

[xiii] Burma News International (2023, 26th May). Rare-Earth Mining Cause Drought and Landslides in Chibwe Township. Access here.

[xiv] Gambling house in rare earth mining areas are small, rudimentary establishments catering primarily to mine workers. They are not of the same scale or gaudy opulence as the large casinos operating in gambling enclaves close to the China that attract gamblers from China.


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