Assessment and Status Report on Just Energy Transition in Mongolia

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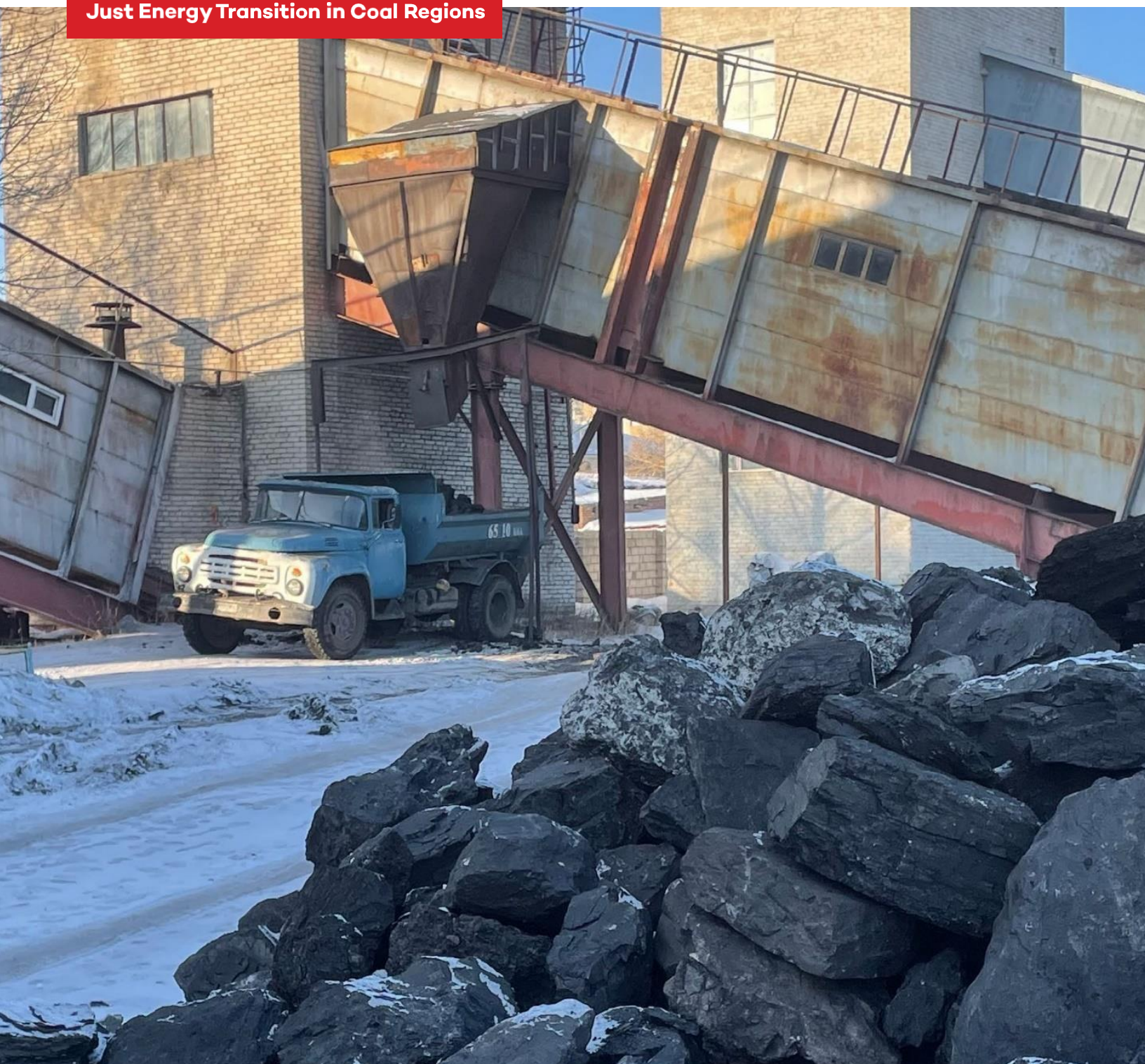
May 2024

Just Energy Transition in Coal Regions



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IKI JET and its JET-CR Platform aim to support and accelerate just energy transitions away from coal to renewable energies and other sustainable economic activities in Colombia, Chile, South Africa, Indonesia, Vietnam, Thailand, and Mongolia.

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It aims to particularly amplify the voices of workers and communities dependent on coal showing how knowledge can work in practice. It also turns practice into knowledge by bringing local experience into global conversations and advancing just energy transition expertise.

Providing regular digests of articles, research papers, news stories and events it serves as a "one-stop shop" for collecting up to date information related to just energy transitions away from coal around the world.

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Abbreviations and Acronyms

ADB	Asian Development Bank
CHP	Combined Heat and Power Plant
DC	Democratic Party (Mongolia)
EE	Energy Efficiency
ERC	Energy Regulatory Commission
GDP	Gross Domestic Product
GHG	Green House Gas Emissions
GoM	Government of Mongolia
GW	Giga watt
GWh	Giga watt hours
HOB	Heat only boilers
IKI JET	Innovation Regions for a Just Energy Transition
IMF	International Monetary Fund
JET	Just Energy Transition
kW	Kilo watt
kWh	Kilo watt hours
MPP	Mongolian People's Party
MoE	Ministry of Energy
NDC	Nationally Determined Contributions
NGO	Non-Governmental Organisations
RE	Renewable Energy
SME	Small and Medium Enterprise

1 Introduction

1.1 Aim of the assessment of the starting situation and underlying understanding of Just Energy Transition

Goal of the analysis of the starting situation

The project “Innovation Regions for a Just Energy Transition” (IKI JET) aims at supporting and accelerating just energy transitions (JET) away from coal to renewable energy and other sustainable economic activities in the Global South, contributing to a reduction of Green House Gas (GHG) emissions. The ‘Assessment and Status on Just Energy Transition in Mongolia with a regional focus on the Nalaikh district’ as presented in the following is meant to prepare the ground for an adequate understanding of those political, societal and economic structures and developments which are key to a JET process. The study of the Nalaikh district also serves to identify reoccurring themes as a starting point for the definition of potential deep dive areas (as topics for small scale technical assistance).

Common understanding Just Energy Transition

A holistic Just Energy Transition process is combining the following six dimensions in a just and balanced way while having a positive climate impact. Support services for just-transition processes should be long-term and flexible including the following cross-cutting issues: leave no one behind, gender equality and non-discrimination. Furthermore, the challenges and opportunities are addressed through supporting regulation and policy frameworks. A regional transition strategy guides choices and actions in the transition, enabling the various stakeholders and decision-makers to align actions to form a coherent and effective approach. Complex transitions need to be governed using a multi-level and multi-actor approach.

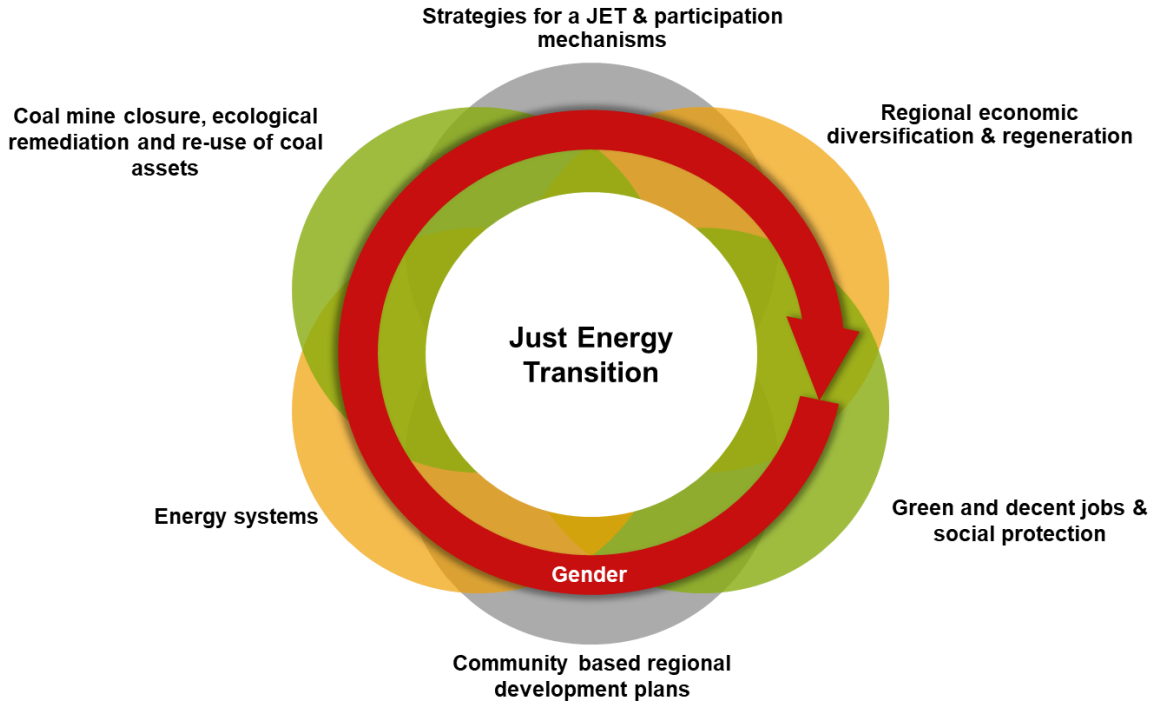

Figure 1. Jet dimensions
Source: based on own research

To ensure a just energy transition, exploratory research has been conducted to identify the main areas of operation for the project and support the implementation of IKI JET activities. The project supports the aim of reaching the Paris Agreement of 2015, keeping global warming below 1.5°C. The following list provides an overview of key elements identified:

- Reduce coal related economic activities (mining, energy, chemistry…)
- Foster a sustainable energy mix by supporting all kinds of RE related activities (develop, manufacture, install, run RE facilities)
- Identify all kinds of potentials for developing and fostering green economic diversification, growth and regeneration towards a climate-neutral economy (natural resources such as soil resources, landscapes, woods, other green and blue infrastructures; technological and economic strengths, skilled work-force, cultural assets…) activities
- Focus on coal regions and develop community based regional development plans for a coal phase-out

1.2 Structure and methodology of the assessment framework

Methodology

The assessment and status on just energy transition in Mongolia with a regional focus on the Nalaikh district has been conducted applying a mixed-methods approach to collect and analyse the information and data needed. It consisted of desk research comprising documents and studies on the one hand and data gathering for statistical indicators on the other hand. Further, it builds upon the initial findings of the IKI JET mission conducted from 25th of November until 7th of December 2022 in Ulaanbaatar, Mongolia for the identification of key actors and stakeholders, interviews with the latter, an on-site visit of the Nalaikh district and a survey with former coal miners. In the following chapters, this report:

- Maps the relevant stakeholders for a JET process at both, national and regional levels (Chapter 2)
- Describes the role of women and marginalized groups in the focus region (Chapter 3)
- Provides a description of drivers of climate change, climate impacts and climate relevant policies (Chapter 4)
- Provides a basic description of the societal aspects of the country and the region on which this assessment is focused (Chapter 5)
- Describes the governance and economic context in the country and in the Nalaikh district (Chapters 6 and 7)
- Describes the energy sector both on the national and the regional level (Chapter 8)
- Provides conclusions and policy recommendations regarding thematic areas of JET (Chapter 9)

1.3 Energy transition and coal region

There is no specific policies or plans dealing with a coal phase-out yet for Mongolia, but as a country with high levels of air pollution in winter, the country plans to reduce emissions from coal-fired heating and cooking stoves. In 2020, Mongolia updated its Nationally Determined Contributions (NDC), which commits to a 22.7 % reduction in greenhouse gases by 2030. Achieving this target would result in an estimated 12 % reduction of black carbon emissions and a 23 % reduction of methane emissions. In 2020, the President of Mongolia announced that a 27.2 % reduction of greenhouse gases could be achieved by implementing rigorous conditional measures, such as waste-to-energy programs, which were put in place. Mongolia also aims to increase the capacities of renewable energy sources (20 % in 2023 and 30 % in 2030) and intends to improve efficiency of energy production

The National Action Program on Climate Change is the central document guiding Mongolia's reaction to climate change, highlighting mitigation actions across several sectors. Its second phase (2017-2021) will see the implementation of adaptation and mitigation measures. The program aligns with Mongolia's long-term Sustainable Development Vision, launched in 2016. The Sustainable Development Vision report highlighted the goals to reduce greenhouse gas emissions across its sectors to improve air pollution. The Mongolian government's Vision 2050 and Action Plan for 2020-2024 pursue progressive goals as well as measures, including reducing greenhouse gas emissions and increasing carbon absorption in energy, agriculture and forestry, construction, transportation, industry and waste, peatland protection, and so on. In the construction industry, domestic industries that produce environmentally friendly and energy-efficient products will be supported.

Nevertheless, regarding the coal industry, the last decade has seen an expansion of coal production rather than a trend toward a coal phase-out. Moreover, Mongolia's economy is heavily dependent on coal exports to China, which leads to a strong dependence on China due to an undiversified economy. An opportunity to move toward a JET can be seen in the fundamental awareness among key stakeholders and decision-makers that they will be forced to take action to phase out coal in the medium and long term due to the severe impacts of climate change in Mongolia, and possibly due to increasing international political pressure and limited access to finance. In addition, the country has very large potentials to develop wind and solar energy, but financing such RE projects on a large scale is a problem.

Nalaikh is the first district in Mongolia whose development and growth has been heavily impacted by coal mining. At the same time, it is also the first district that already entered a major economic transformation away from coal mining, as the biggest mine the district relied upon closed. Thus, the economic situation and need for diversification is very different from other districts and the national level. The national economic plans and political strategies are all merging into a scenario of increasing coal exploration and exports to China for the next 10 years whereas Nalaikh already officially phased-out coal mining in 1992 (phase 1) and banned informal coal mining in 2022 (phase 2). This means there is no more mining happening in the region. The phase-out in 2022 had a relatively low impact according to official economical figures. However, in a microeconomic perspective it destroyed the income source for the former mining families (decrease from more than 2000 families in the period from 1992 to 2010 to about 500 families in 2022). Approaches for the transition of energy production away from coal and RE potentials are described in chapter 8. Geographically, the Nalaikh Depression is in the central area of Mongolia, 36 km from Ulaanbaatar City. Nalaikh is also one of the 9 districts of the capital city. The expansion of the suburbs toward the Nalaikh District has resulted in the construction of a construction materials trading center, cement factory and a university campus, logistics center, railway and highway extensions connecting to Russia and China.

Figure 2. Geologic structure map showing location of Ulaanbaatar City and Nalaikh Town

Source: District of UB City, n. d.

2 Stakeholder Analysis

Despite the international context where pressure and efforts to reduce global GHG emissions increases, in Mongolia, the benefits of a coal phase out on the economy and energy system are not gaining traction among many stakeholders. The government lacks coal-related commitments (International Energy Agency, 2022) and stakeholders approaching the topic are still in the initial phase of analysing benefits and obstacles for JET. To approach the Mongolia JET-situation, stakeholders have been identified.

The decision-making processes at the national level directly influences and induces changes at the local level. These dynamics at the national level can involve political, economic, and social actors, as considered by Ohlendorf, Jackob, and Steckel (2022). Within the JET context, these stakeholders can implement measures that may either facilitate or hamper a JET at the local level. To assess their impact on the local level, it is relevant to consider three stakeholder dimensions from which actors can exert influence from the national level: the political, economic, and social spheres. Figure 3 (below) shows the main stakeholders influencing JET-related activities on the national level in Mongolia as well as the stakeholders affected by such measures at the local level in the Nalaikh district. The different roles played by stakeholders at the national level will be then addressed to have a clearer view on how they can support, hamper, or modify their neutral stance towards a JET.

For an effective governance model to be promoted, as considered by the Wuppertal Institute (WI, 2022)[1], three elements have been taken into consideration: first, the influence that stakeholders have on JET processes, regulations, or overall decisions (x-axis); second, the level of impact that JET would have on stakeholders, and thus on their day to day business models or activities (y-axis), and third, the level of interest that stakeholders have on pushing a JET (red dot size, where smaller dots represent less interest and bigger dots represent higher interest). These three elements are portrayed in Figure 4 (below), as perceived by GIZ Mongolia. The results of this influence-impact-interest analysis showcase that there is a list of stakeholders that would be affected by JET, however that do not have influence over JET-related decisions. The figure also illustrates how the Thermal Plant in Nalaikh, which would experience the highest impact from JET, has also little interest in pushing the JET while it's influence on decisions is limited.

1 For further information check the Just Transition Toolbox for coal regions by Wuppertal Inistitute, available at https://www.coaltransitions-toolbox.org/

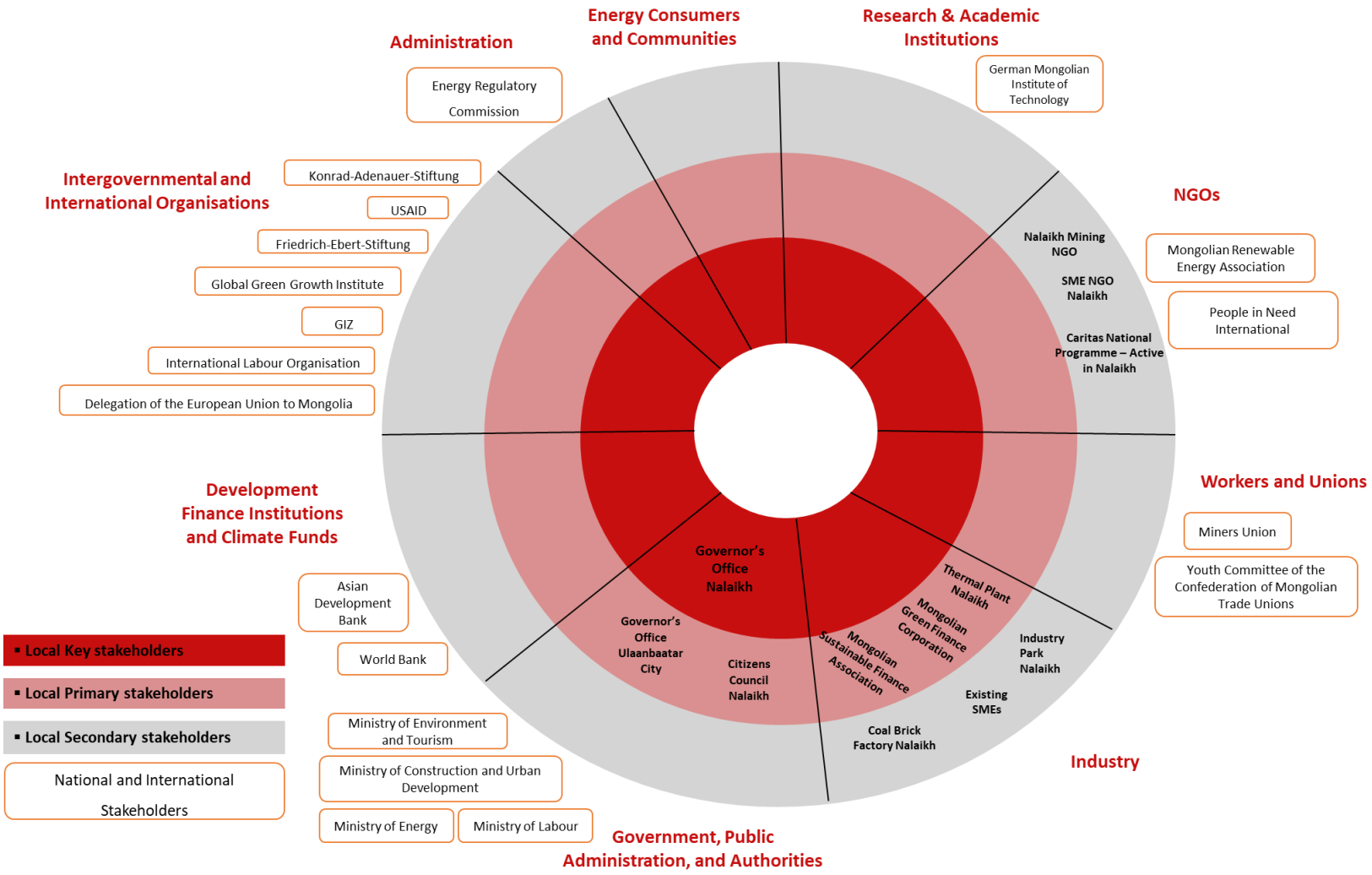

Figure 3. Stakeholder and value chain mapping

Source: Own research

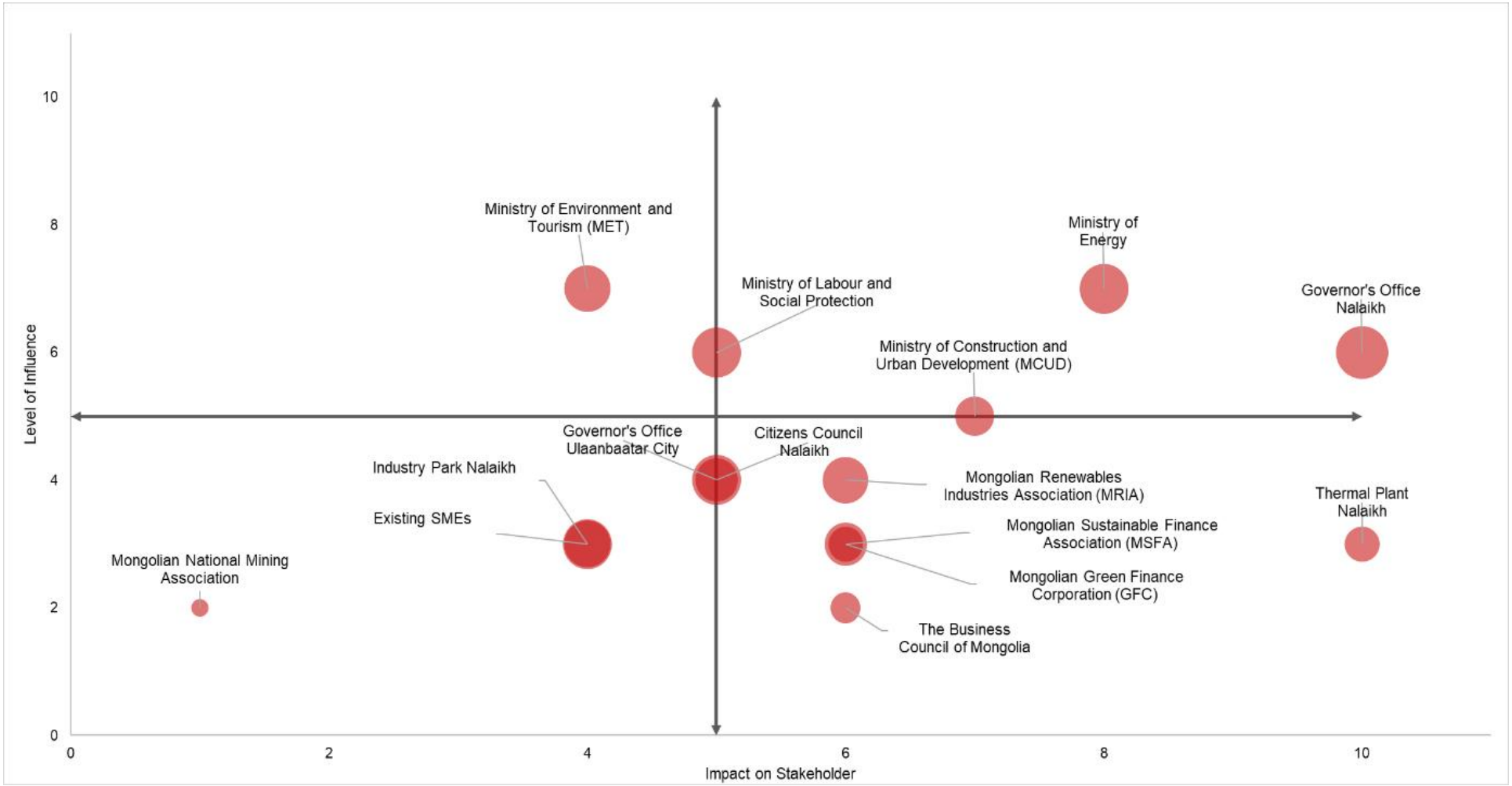

Figure 4. Influence over impact and interest on stakeholders in Nalaikh

Source: Own research

Considering the stakeholder map that provided an overview of the national and local (Nalaikh) context (Figure 3) and as well as Figure 4 on the influence, impact, and interest of stakeholders in Nalaikh, some positive and negative impacts of JET on different stakeholders should be acknowledged. These impacts would allow to assume the stance that actors could take once JET processes are in place.

As visualized in Figure 3, on the local level the Governor's office in Nalaikh is a key JET actor since it has the power to support the implementation of JET through action plans and can contribute to the engagement of different stakeholders as means to promote an inclusive JET process. The economic diversification, which JET can enable would allow the district to attract more businesses and investments, while safeguarding jobs and the life quality of individuals.

For instance, once the Industry Park for building materials is established, alternative businesses for Nalaikh could emerge, resulting in a source of employment and tax revenues. A regionally supported JET would attract the attention of stakeholders at the national level (e.g., MGFC), as well as at the international level (e.g., SME support program of the European Delegation). The involvement of the financing and banking sector with JET interests would be expected. Energy-related stakeholders such as the Thermal Plant and Coal-fired brick factory in Nalaikh, appear to have less influence on the decision-making processes, yet would be affected by JET measures and thus must be kept engaged of the JET progress to ensure a timely transition of individual business model and purpose. Stakeholders such as the Ministry of Labour and Social Protection, and the Governor's office at Ulaanbaatar City should be actively approached and informed during the process. Besides the neutral positioning these stakeholders have high influence on future decisions and might become driving forces to support JET.

For now, Mongolia has no real driving force on the national level when it comes to JET. However, financial institutions, including private banks and development banks, seem to be the most active actors in fostering green investments in the country. Most efforts by private actors, such as building associations, have focused on auditing the viability of green investments (e.g. sustainable finance taxonomy), but without a specific focus on JET. Academic actors, international organizations and renewable energy associations support the JET targets in principle, but not yet proactively. Actors at the national level are actively advocating for greenhouse gas (GHG) emission reductions in the country pushing for an alignment with Mongolia's NDC commitments1, yet they are simultaneously promoting further utilization of coal in the country.

Due to the heavy dependence of Mongolia's energy system and economic business model on coal, actions hampering the JET processes are not only numerous but also reflected in the key decision-making processes. Stakeholders influencing these measures include thermal power plants, mining companies, mining-related public actors (e.g. the Ministry of Mines and Heavy Industry), some business associations, and coal mining companies' associations. In addition, trade unions and informal miners have also spoken out against coal phase-out measures, fearing job losses. National authorities have not committed to neither an international nor a national coal phase-out agreement. Authorities continue backing the coal industry as they seek

to rely on new coal-fired power plants to overcome the energy shortage (especially for heat production). Despite the support for the export-oriented coal industry and the government's plan to expand coal-based heat and power (CHP) plants in its 2020-2024 Action Plan 2, national authorities have parallelly committed to reducing emissions in the 2020-2024/Vision 2050 Action Plan3.

Considering JET is a new topic that is being analyzed in Mongolia, the stances of stakeholders are not fully clear. Actors considered as JET supporters (e.g. finance institutions) are not directly pushing JET, however, their actions are partially in line with JET goals. Similarly, stakeholders opposing JET (e.g. Ministry of Mining) are mainly actors whose day to day business relies on coal and thus, they perceive the shifting of the coal sector as a threat to their performance.

3 Role of women and marginalized groups

The total population of Mongolia in 2021 was 3.4 million people, of which 50.9 % were women. The population is relatively young with 32.1 % aged 0-14 years and 63.4 % aged 15-64 years. The majority of the population (69.4 %) lives in urban and mining areas and 30.6 % in rural areas According to the statistics in 2021, 47 % of all employees and a total 45 % of the unemployed are women. The society of Mongolia is traditionally patriarchal and men therefore often take important roles in politics and society. Gender inequality has different dimensions in rural and urban areas. For example, men in rural areas own most of the land and livestocks, at the same time they have the responsibility to provide for the family.

Unlike the expectation, boys tend to be excluded from education - which leads to informal employment in the informal sector of the economy - as they are considered fit for labour intense work such as herding livestock. This leads to a gap between men and women in their educational level with men lagging behind.

Despite higher educational attainment and higher life expectancy, women are less represented in the workforce. The labor force participation rate of the female population aged 15 and older is 53.3 % as of 2019, whereas the participation rate for men is 66.7 %. Women are employed mainly in the informal sectors such as wholesale and retail, but less in high-paid sectors such as mining, transportation and energy, where prospects for advancement are greater, as well as in managerial and technical roles (EPCRC, 2014). Furthermore, the highest unemployment rate with 17.1 % is experienced among females between 15-24 years old. Employers are reluctant to recruit young women of reproductive age or mothers of young children, and concerns remain about coerced early retirement among female employees. The national average wage for women is 14.3 % lower than for men.

In the **energy sector**, there is a lack of gender specific sectoral policies or assessments available for the public. The existing information regarding women‘s representation in the energy sector is about Energy Regulatory Commission (ERC), which comprises of a total of 72 staff members (48 % are female). Out of seven senior officers, four are women (information was obtained through an interview). The ERC does not have its own specific strategy or policy on gender and equal opportunities. Overarching principles of equality are regulated by the Labor Law and Ethical code of the organization with no specific reference to gender or any other diversity grounds. Gender equality is not seen as a principle that should be embedded in organization’s core processes; thus, decision-making processes can be seen as gender-blind**.** At the time of this analysis, ERC staff members have not received any training on gender equality or gender mainstreaming. There is no institutionalized policy enabling staff to balance work and responsibilities. Therefore, this raises concerns, whether there is an existing organizational culture and enabling environment or ad hoc regulations that create opportunities for the working parents, especially women. ERC does not have a gender focal point or any other officer responsible of gender issues.

The Ministry of Energy is the state central administrative organization which is responsible for energy supply and its sources, technology, and renewable energy production. The Ministry has a mandate of formulating and implementing state policies for the development of the sector. If we look at the gender ratio of the senior management of the MoE, men are appointed as minister, deputy minister, and state secretary. Out of 13 directors of departments and divisions, only two of them are women (15.3 %) (MoE, 2021).

Referring to the MoE's report from 2021 on the implementation of National Programme on Gender Equality NPGE and its action plan, it was evidenced that the gender ratio of all employees has met the quota stipulated by the Law. However, 2 out of 13 departments/divisions of the ministry are headed by women, which does not meet the legal quota stipulated in Article 10.1.2 of the Law on the Promotion of Gender Equality LPGE, which states representation of any one sex in decision-making positions in public administration shall not be less than 30 % among heads of department in ministries. From here, it can be concluded that the management and governance structure of the state central administrative organization is dominated by men, whereas the employer has not taken into account and enforced LPGE's requirement of ensuring gender balance at the decision-making level (MoE, 2021).

The participation **rate of female workers in mining** was estimated 16 % in 2020.

However, the energy sector has electricity consumption tariff regulations specifically directed to vulnerable groups (for elders that require constant care; poor people, whose income is below 40 % of national poverty line; a single mother/father led household with more than 4 children; and people with disabilities) in ger areas, which could be considered as a good practice of integrating gender, plus social inclusion, not only at sectoral, but also at a national level.

Gender equality policies and measures are in place, supposed to facilitate the efficient and effective implementation of equality goals and plans. In 2011, Mongolia has enacted the Law on the Promotion of Gender Equality (LPGE); and adopted and implemented the Medium Term Government Strategy (2013-2015) and the National Program on Gender Equality (2002-2015) (2017-2021) to ensure the enforcement of the law; now adopted and presented the Cross-Sectoral Strategic Plan for Promotion of Gender Equality (2022-2031) for all ministries. As of 2023, 21 provinces and the capital city including the 9 districts have adopted sub-programs to ensure gender equality and implemented the gender policies. Although the regulative requirements have improved, there is a lack of understanding of gender equality at all levels, inter-sectoral coordination on gender issues, and the full use of donor research and financial support.

The LPGE promotes gender equality and sets out obligations for the government and other key actors in the spheres of politics, employment and labour relations, civil service, education, health care and family relations. However, there has been a lack of political commitment to and awareness of gender inequality at government level, a lack of financial and human resources, and the absence of a stable, long-term government administration for it's implementation.

Climate change causes significant challenges to Mongolia (see chapter 4) As one of the most arid countries in the world, 90 % of the Mongolian territory is classified as moisture deficient. This directly impacts livelihoods of women and men, however, there is a lack of gender-disaggregated data in the country and the differences are not well understood. Hitherto, studies on the difference in affectedness by climate change on men and women or specific social groups in Mongolia have not been conducted, nor is statistical data available. An international study reveals that direct and indirect impacts of climate change on men and women can be attributed to existing gender inequalities. Analysis and reports of disasters in 141 countries have estimated a correlation between women's rights and gender disparities in death rates whereas in societies where women and men enjoyed equal rights there were no significant differences in deaths in case of gender (Neumayer/Plumper, 2007).

No studies or research have been conducted thus far concerning the impact of the energy or coal sector on marginalized groups. For instance, consider the case of women employed in the coal transportation industry, responsible for ferrying coal across vast desert expanses to facilitate exports to China. These women toil far from their homes, often separated from their families and children, as they undertake the strenuous task of hauling substantial coal loads. This profession, demanding as it is, offers higher remuneration, thus motivating their involvement.

These hazards have a direct impact on the lives and livelihoods of individuals, affecting women and men in different ways. However, these differences are often poorly understood due to the absence of both quantitative and qualitative sex-disaggregated data. Such evidence is not currently available in Mongolia, as well as in many other countries in the Asian region. In the absence of this data it is recommended that the situation of women compared to men is examined through a review of Mongolia's socioeconomic profile. To investigate gender-based inequalities and discrimination that have the potential to impact women's resilience, researchers will study men in rural areas.

4 Climate Change

4.1 Climate policies / Strategies / NDCs

Historical climate warming is believed to have taken place at some of the fastest rates in the world in Mongolia and other shifts in climate dynamics are already strongly impacting on lives and livelihoods. In response, Mongolia has engaged closely with international efforts to mitigate climate change and its impacts. In 2016 the nation ratified the Paris Climate Agreement, in 2018 released its Third National Communication to the UNFCCC and adopted its Updated Nationally Determined Contributions in 2020 (WWF, n.d.).

Mongolia has set **a new target of reducing its greenhouse gas (GHG) emissions by 22.7 % by 2030.** This new mitigation target, which excludes land use, land use change and forestry (LULUCF), is an improvement compared to the 14 % goal from its earlier intended NDC. The updated NDC includes additional sectors previously not considered, such as agriculture, waste, and several industrial sectors. In the energy sector, Mongolia intends to increase the use of renewable energy sources and improve efficiency of energy production. **Mongolia has not committed on international or national level to a coal phase-out, neither for energy production nor for exporting coal.**

Table 1. Overview of NDC mitigation targets 2016 to 2020 (WWF, n.d.)

Targets	NDC 2016	NDC 2020	Analysis by WWF
Strengthened An economy-wide absolute 2030 target mitigation targets	Commitment to a 14% reduction in total national GHG emissions excluding Land use, land use change and forestry (LULUCF) by 2030, compared to the projected emissions under a business as usual (BAU) scenario. It is also mentioned that in future communications, Mongolia intends to include actions for mitigation in the forestry sector to reduce GHG emissions from deforestation and forest degradation by 2% by 2020 and 5% by 2030	Mongolia intends to achieve a target to mitigate its greenhouse gas emissions by **22.7% by 2030**, compared to the business as usual (BAU) scenario, excluding LULUCF (unconditional target). In addition, if conditional mitigation measures, such as the carbon capture and storage and waste-to- energy technology are implemented, then Mongolia could achieve a **27.2%** reduction in total national GHG emissions. Along with that, actions and measures to remove GHG emissions by forest are determined, which set the total mitigation target of Mongolia as **44.9% of GHG emission reduction by 2030** (conditional target).	The mitigation targets raised from the initial commitment of reducing 14% to 22.7% (up to 27.2%; conditional) by 2030, compared to the business as usual (BAU) scenario, excluding LULUCF. However, the 2020 NDC has a recalculated baseline for emissions up to 2030, which are estimated to reach 74.3 Mt CO2-eq. in 2030 without LULUCF, compared to the 2015's INDC baseline of 51.3 Mt CO2-eq. The NDC states that the difference is primarily due to a variance in the methodology applied for base year emission (Revised 1996 IPCC GLs for INDC and 2006 IPCC GLs for NDC), as well as increasing numbers of livestock and additional policy plans in the industrial processing sector, e.g. coal gasification project. Due to this change it is unclear whether ambition has increased or not.

Targets	NDC 2016	NDC 2020	Analysis by WWF
An economy-wide absolute 2030 target	The NDC mentions an annual reduction of 7.3 Mt CO2-eq. of economy-wide emissions in 2030, corresponding to a 14% reduction, compared to a BAU scenario	The mitigation target of Mongolia's NDC will be a 22.7% (up to 27.2%) reduction in total national greenhouse gas (GHG) emissions by 2030.	Both NDCs present economy-wide absolute 2030 targets.
A 2021-2030 carbon budget aligned to 1.5°C	Not mentioned	The NDC refers to an emission target of 57.4 Mt CO2-eq. by 2030 (compared to a BAU emission of 74.3 Mt CO2-eq. in 2030).	The 2020 NDC brings a carbon budget. However, the baseline for the calculation of the carbon budget has been changed, compared to the previous NDC. According to the Climate Equity Reference Calculator, the carbon budget provided is not aligned with 1.5C (Climate Equity Reference, 2024)
Forage harvester	CAD 222.81	70	CAD 15,597

Key national policy documents include the National Action Plan on Climate Change (2011–2021) and the Green Development Policy (2014–2030) (World Bank Group/Asian Development Bank, 2021).

The Vision 2050 is an important long-term development strategy of the Government of Mongolia, including energy and climate topics. It is the long-term Development Policy of Mongolia, approved by the Parliament (Resolution No.52, adopted in May 13th, 2020). Goal 6.4 is defined as "Develop a low-carbon, productive and inclusive green economy and contribute to international efforts to mitigate climate change." **For the phase from 2021-2030**, the following tasks have been defined:

1. Introduce environmentally friendly and efficient advanced technologies to improve the productivity and to develop a zero-waste economy saving natural resources.
2. Reduce greenhouse gas emissions and increase carbon absorption in energy, agriculture, construction, transportation, industry, and waste sectors.
3. Strengthen the ability to adapt and withstand climate change and reduce potential risks.
4. Support and develop the national green finance system based on public and private sector partnership, and finance environmentally friendly green projects and programmes using international financing methods.
5. Increase the amount of waste recycling by implementing the 3R comprehensive management of reducing, reusing and processing waste at its source and putting it into economic circulation.

Activities foreseen for this phase comprise inter alia:

- Implement the Paris Agreement, ensure implementation of Mongolia's National Determined Contribution (NDC) document, develop renewable energies, and reduce GHG emissions in the energy, agriculture, construction, transportation, industry, and waste sectors.
- Increase the absorption of GHG by afforestation, protection of peat bogs, rehabilitation of damaged areas, protection of plant cover and vegetation.
- In the construction industry, domestic industries producing green and energy-efficient products will be supported and developed.

However, these activities seem to stand in sharp contrast to many of the short-term activities planned in the **Action plan of the Government of Mongolia for 2020-2024.** Very critical in regard to climate mitigation objectives and a JET is the intended massive expansion of coal-based heat and power plants (CHP):

- Expand the capacity of CHP Power plant IV by 46 MW, and of Erdenet's Power plant by 35 MW respectively.
- Expand the capacity of the Choybalsan's CHP plant by 50 MW.
- Start construction of a 450 MW CHP power plant at Tavantolgoi and related infrastructure.
- Start the construction of a 300-400 MW CHP power plant-based coal deposits sites in the central, eastern, and western regions.

Compared to those, the intended expansion of 15 MW wind power plants and 35 MW solar power plants is very modest. The massive expansion of coal-based heat and power plants also contradicts other intentions of the action plan such as "Reduce Ulaanbaatar air pollution by up to 80 % and phased resolution of air pollution in other major cities and towns".

Intended action with positive impact for a JET process comprise:

- afforestation station with a capacity of 160 MW
- Introduction of innovation and new technologies to save energy, improve efficiency, reduce losses, and step by step transition of energy price tariffs into the market system.
- Increase the area covered by forest by 8.6 % and create a legal and judicial environment for citizens and industrial units who have contributed to the green development by planting trees.
- Eight thousand hectares of land that have been damaged and abandoned for years due to mining activity will be reforested and cultivated.
- Implementation of policies for climate mitigation and adaptation, efficient and accessible green development, and reduce greenhouse gas emissions by 12.3 %.

4.2 Causes

National Level

In the following, the emissions of climate-damaging greenhouse gases are considered and the main emitters of these are shown. An overview of Mongolia's emissions over time is provided in the following table.

Table 2. Basic climate indicators (Our World in Data, 2024)

Basic climate indicators	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
CO2 emissions total (million tonnes)	21,37	35	43,48	29,63	23,28	25,63	34,14	45,32	47,25	49,61	50,32
CO2 emissions (metric tons per capita)	7,8	12,5	15,3	10,2	7,9	8,5	11	14,3	14,6	15.1	15
CO2 emissions from energy sector using coal (million tonnes)	18,2	31,4	39,79	26,01	19,7	22,53	30,07	40,95	41,76	43,84	44,4
Greenhouse gas emission (million tonnes Co2-equivalents)	46,69	59,8	68,59	57,34	50,52	58,34	71,16	83,29	87,41	90,07	93,27

As can be seen from time series above, GHG emissions in Mongolia have increased overall over the past decade. However, there was a drop in emissions in the period of 2014-2017, which can be attributed to an economic crisis. At 15 tons of CO2 in 2021, Mongolia has very high per capita emissions by international standards. The reason for this is the high proportion of coal used to generate electricity and heat. In order to identify the key drivers of climate change, the

contribution of all sectors of the economy to GHG emissions has to be considered. The following figure shows the greenhouse gas emissions (GHG) differentiated by sectors.

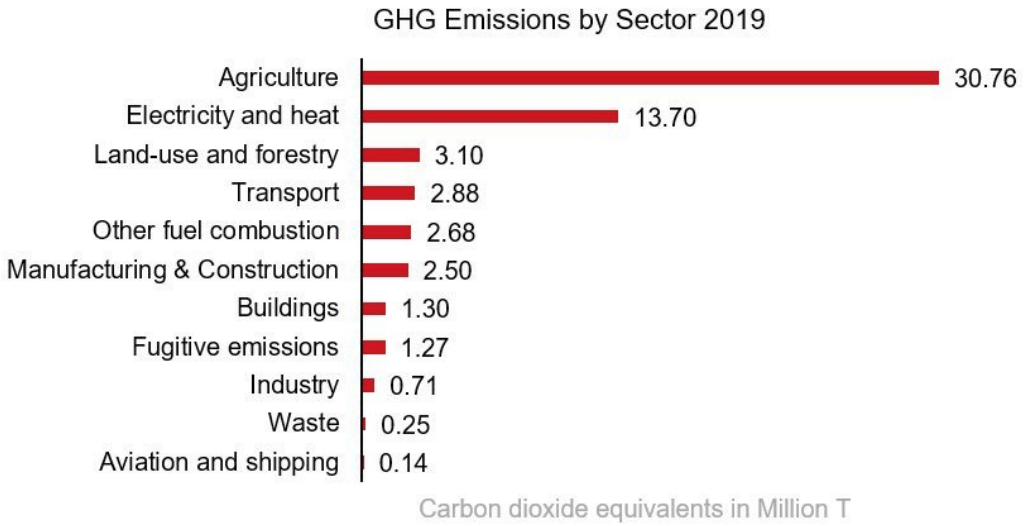

Figure 5. Greenhouse gas emissions by sector in Mongolia in 2019

Source: Climate Watch, 2023 – with major processing by Our World in Data.

It should be noted that in this presentation all greenhouse gases are considered and converted into CO_2 equivalents. Agriculture is by far the largest emitting sector with 30.76 million tons of CO_2 equivalents in 2019. This is mainly due to methane emissions from livestock farming of cattle, sheep, goats, camels and horses. The second largest sector is electricity and heat with 13.7 million tons of CO_2 equivalents. These emissions are mainly caused by the combustion of coal and oil. The next figure shows only CO_2 emissions by sector for Mongolia.

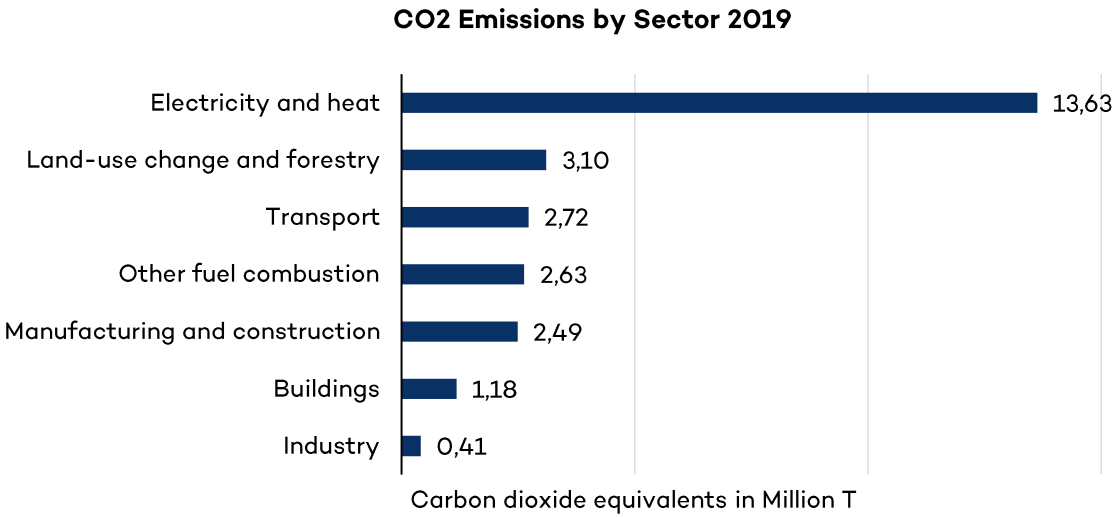

Figure 6. CO_2 emissions by sector Mongolia

Source: Climate Watch, 2023 – with major processing by Our World in Data.

Agriculture disappears from the analysis, so electricity and heat remain as the largest emitter of CO_2. Electricity and heat are mainly based on coal, which causes most of the CO_2 emissions. If we now look at CO2 emissions broken down by fuel or industry in the next figure, it is clear that coal accounts for by far the largest share of emissions, approximately 88% in 2021.

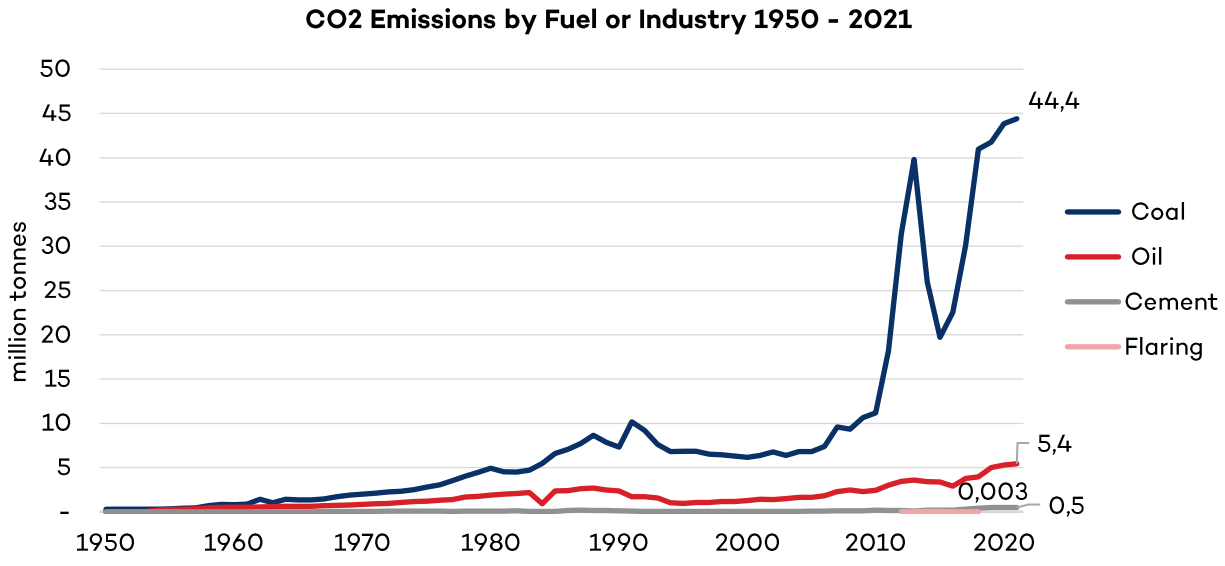

Figure 7. CO_2 emissions by fuel or Industry in Mongolia

Source: Global Carbon Budget, 2023 – with major processing by Our World in Data.

There is a big need to increase energy efficiency because economic growth is still not based on a more efficient use of energy. It has even become more CO_2 emission intensive in recent years as indicated in the following figure.

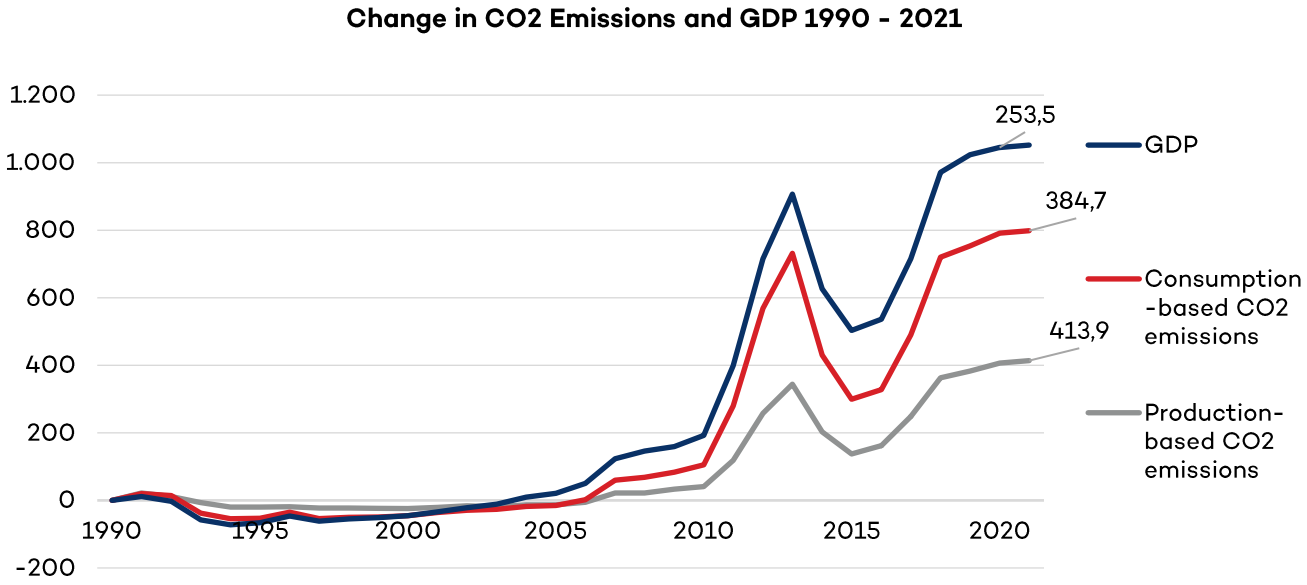

Figure 8. Change in CO_2 emissions and GDP in Mongolia
Source: World Bank, 2023 – with minor processing by Our World in Data.

Regional Level

Emissions estimates from the closed Nalaikh coal mine indicate that the mine workings are now completely flooded and there are negligible emissions from the abandoned mine (MNEC, 2010). When the mine was operating, the excess mine gas was vented. Emissions rates from the mine prior to its closure (for the period from 1988 to 1993) have been estimated to be as high as 355 liters methane per second (MNEC, 2010). This closed mining area is left without any reforestation which is hazardous.

There is no specific study related to climate change for the region. The total number of households in the Nalaikh district is 10.790 and 7.960 out of it live in the ger area (traditional housing) where coal is burned for heating during the winter. The number of stoves which are used for burning coal in ger areas is the main contributor for GHG emissions and air pollution.

Because of the public transport insufficiency, the reliance on private vehicles applies for most people which is to be addressed for emitting GHG.

4.3 Impacts and risks

National Level

Mongolia consists of highlands vast steppe plains and deserts with an average altitude of 1.580 meters (5184 feet). It has a very extreme climate with average temperatures of -25 °C in winter and 20°C in summer and belongs to the climate zone "Moderate zone of the northern hemisphere". Mongolia has low forest resources, and due to its harsh climate, the growth of its forests is slow. According to a variety of climate models, projections for Mongolia suggest that continued global warming will result in increased winter temperatures and snowfall, while summer temperatures will not greatly rise, but the amount of rainfall during summer will increase slightly. Key climate change impacts and other hazards which Mongolia faces are presented in the table below:

Table 3. Key Climatic and Mixed Hazards Mongolia faces (Asian Development Bank, 2022)

Dzuds: These occurrences typically happen when a severe summer drought is followed by an extreme winter. Dzuds are primarily caused by (i) meteorological conditions, including blizzards, heavy snow, extreme cold, and pastures frozen solid with ice; and (ii) lack of available pasture due to droughts and overgrazing. The frequency of dzuds has significantly amplified the risks of poverty among rural communities, particularly herders.
Drought: Historically, drought in spring and summer occurred approximately once every five years in the Gobi, and once every ten years in other parts of the country. However, since 1991, there has been some level of drought in Mongolia annually. In addition, the water resources of Mongolia, including groundwater, are currently under increased stress due to the burgeoning mining industry, larger herd sizes -- especially cashmere goats -- and rapid urbanisation, which places a strain on limited water supply systems. Sanitation services in the city may be affected by increasing temperatures and evaporation rates caused by climate change.
Snowstorms: Strong winds give rise to severe snowstorms in autumn and winter, and dust storms in late winter and early spring. Windstorms strip off the topsoil, making agriculture extremely challenging. The Gobi Desert region experiences particularly intense dust storms, which worsen during droughts. Since 2000, dust storms have been occurring more frequently, with stronger winds and greater amounts of dust, and lasting for longer periods. Additionally, the winds have contributed to severe snowstorms and blizzards, which have been known to deposit up to one metre of snow within a short period. Some years have seen deadly blizzards, including 2001 and 2008
Extreme cold and heat waves: It's a common phenomenon, and their patterns are changing. Since the 1940s, the average frequency of days with extreme high temperatures (i.e., maximum air temperature above 26°C) has increased by 16 to 25 days per year, while the frequency of days with extreme cold (minimum air temperature below –50°C) has decreased by 13 to 14 days per year.

Floods and Landslides: The country is susceptible to flooding. During spring, snowmelt from the Mongolian Altai, Khovsgal, and Khangai mountain ranges commonly result in flooding of the rivers. Livelihoods are impacted, and lives are lost due to flash floods and landslides that can occur after heavy rainfall periods. In July 2018, heavy rainfall caused flash floods in several parts of the country, affecting almost 3,000 people. To reduce the flood risk in Ulaanbaatar City, the settlement in the floodplain is being regulated.

Desertification, deforestation, and land degradation: Overgrazing, ill-advised land use policies, such as converting large prairies into croplands, and excessive logging from the previous generation can amplify land degradation, which has so far not been adequately balanced with reforestation efforts. Moreover, wildfires have contributed to these issues. It is projected that climate change effects will only serve to exacerbate the rate of desertification and land degradation.

Steppe and forest fires: Mongolia is one of the most prone countries in Asia to steppe and forest fires due to its low humidity and strong winds during the driest seasons. Forests in Mongolia are predominantly found in permafrost areas, where they store carbon, prevent soil erosion and regulate runoff, thereby preserving water catchments. Over half of the country is susceptible to such wildfires. To forest and grassland fires. Despite up to 95% of these fires being caused by human activities, rising temperatures and repeated dryness have created conditions that are favourable to the growth and dissemination of fires.

Air pollution: Ulaanbaatar and provincial centres officially classify air pollution as a climate change problem due to its close correlation with emissions from coal-fired power plants near Ulaanbaatar (comprising both greenhouse gases and pollutants such as acid gases, mercury, and other toxic metals) and the surge in vehicular traffic. Coal is still the main source of energy, resulting in increased demand. The demand for electricity and heating is on the rise in Ulaanbaatar. The city is heavily reliant on coal for both, with piped steam from power stations used for heating and household stoves in peri-urban areas fueled by briquettes made from coke powder, following the ban on burning raw coal. Emergency mitigation has been necessary to combat air pollution resulting from vehicle and coal emissions in the area.

Mongolia's geographic location, extreme weather, and fragile ecosystems, coupled with prominent pastoral livestock and rain-fed agriculture sectors make Mongolia's economy, livelihood and traditional cultures highly vulnerable to climate change risks (World Bank Group/Asian Development Bank, 2021). At the same time, agriculture is the main emitter of GHG emissions in Mongolia and needs to be considered in a transformative perspective from that viewpoint as well. The country has already experienced some significant changes in its climate with temperature warming of over 2°C and declines in rainfall. These changes caused a chronic drought of the land which again causes secondary impacts such as dust storms. Compared to the global average Mongolia experiences very high rates of warming, which is jeopardising the well-being of humans and ecosystems. Increases of climate-driven hazards like heat waves, droughts and river floods are expected. Long-term warming is expected to set Mongolia's unique ecosystems under pressure with potential loss of forest cover and associated species. Mongolia's food security is threatened by climate changes which lead to poorer harvests of crops (wheat). All

of these negative climate effects will possibly intensify in the coming decades if the average temperature in Mongolia continues to rise as projected in the next graph.

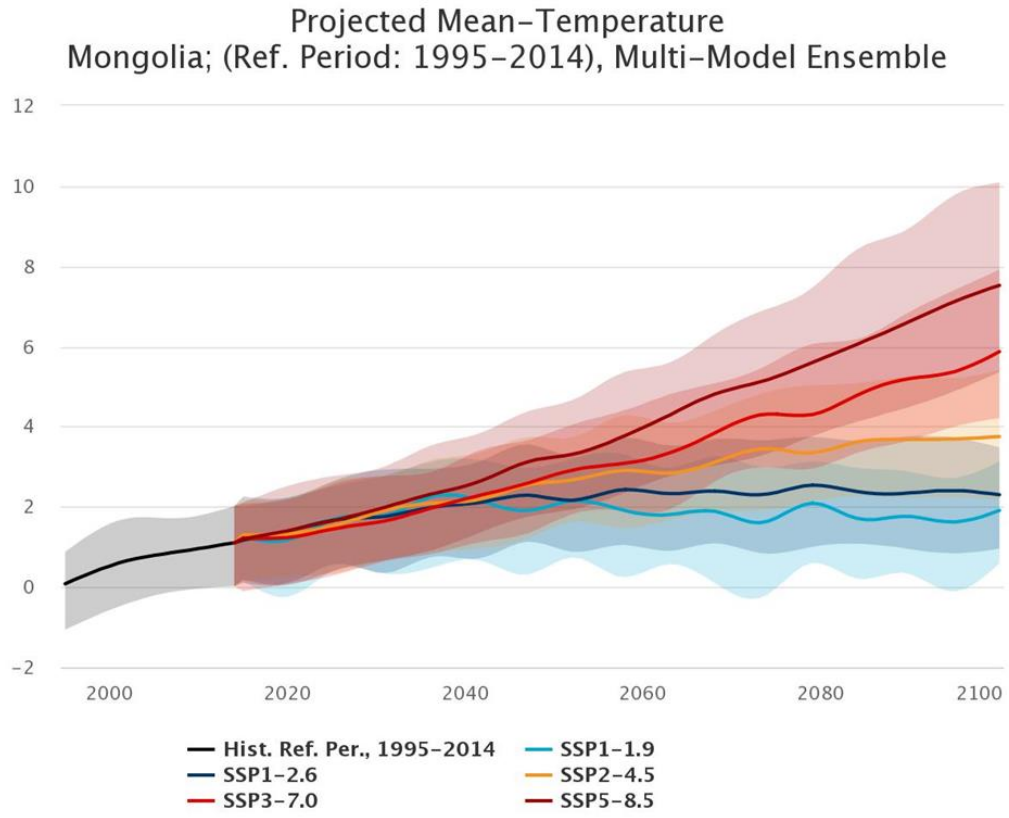

Figure 9. Projected Mean-Temperature Mongolia

Source: World Bank Group, 2024.

Regional Level

The region Nalaikh is a district of the capital city Ulaanbaatar, therefore there is no specific data and research yet in the framework of climate change. Nevertheless, the annual mean air temperature overall Mongolia has increased by 2.07°C from 1940 to 2014. The ten warmest years in the last 70 years have occurred since 1997. In this period, annual precipitation has decreased slightly and the seasonal rainfall pattern has changed: winter precipitation has gradually increased and summer rain has decreased in some regions. Some of the key impacts and vulnerabilities in the region are:

- Winter dzud (heavy snow, cold waves, storms etc.) risk is likely to increase leading to more losses in livestock. Furthermore, winters get colder which requires more demand from the Thermal Plants and the necessity of coal consumption for heating in the ger areas increased.

- The drying up of lakes, rivers and springs and melting of glaciers has intensified in the last decades.
- The intensification of dry climatic conditions cause the increase of the frequency of forest and steppe fires. Recent climate changes have led to chronic drought, and increased exposure to secondary impacts such as dust storms.

5 Society

5.1 Socio-cultural context

National Level

Mongolia is a landlocked country of East Asia characterised by unique ecosystems and cultures. It is situated between Russia to the north and China to the south. While the socialist-ruled country was politically patronised by Moscow until the end of the Soviet Union, today 73% of its exports go to China, half of it being coal (Observatory of Economic Complexity, 2024). Three new railway lines are currently being planned to further boost trade with China. At the same time, Mongolia remains dependent on Russian energy supplies (20 % of its electricity demand; 100 % of petroleum products). Mongolia has abundant mineral resources, including raw materials for information and technology industries. However, to the current state, the main extraction is coal and copper.

The country has democratised quite successfully since the beginning of the 1990s. But the wealth of raw materials, which made the economic transformation of the former agrarian state possible in the first place, poses its own problems, from climate hazards to corruption. It is classed as a Lower Middle Income Country and it needs to bring sustainable development to its population and diversify its economy, which is dominated by export of raw materials, primarily to China.

Mongolia's area is 1,564,116 square kilometres (603,909 square miles). This land mass is about 4.4 times the size of Germany, and with a population of just 3.3 million inhabitants, makes it the 18th-largest sovereign state and one of the most sparsely populated, with many of its communities traditionally nomadic pastoralists.

Figure 10. Provinces of Mongolia
Source: www.commons.m.wikimedia.org/wiki/

In 1950, only 20 % of Mongolians were living in urban areas. Since then, Mongolia has experienced rapid rural–urban migration, especially after its transition from a centrally planned to a market-based economy in 1991. Today, the urban population represents 70 % of the country's 3 million population, while the average urbanisation ratio in Asia is 50 %. Ulaanbaatar accounts for 63 % of gross domestic product, almost half of the country's population, and 66 % of the urban population. Except for the cities of Darkhan and Erdenet (each with around 80,000 people), most of the rest of the aimag (province) capitals and towns have a population below 25,000.

Rural migrations have formed substandard peri-urban settlements, called ger areas, around Mongolia's cities. Currently, ger areas in Ulaanbaatar city represent 60% of the 1.4 million city population, or 30 % of the entire country's population. Unimproved individual coal stoves, which make Ulaanbaatar one of the most polluted cities in the world. The high air pollution led to a politically driven heat transition in different phases:

1. Ban of raw coal (Ulaanbaatar City in 2021 and in 2022 also in Nalaikh district)
2. Use of improved or clean fuel (refined coal) in the main city areas
3. Subsidizing of the electricity usage for heat purposes (valid between Nov 31-Apr 01 of the year) during the heating season in ger areas
4. Emission-free heating technologies such as electric heating in the future.

The impacts associated with the climate-related disaster, locally termed dzud (recognised when a strong winter follows a dry summer) can be severe, resulting in the loss of millions of livestock as in 2009–2010. Mongolia's geographic location, extreme weather, and fragile ecosystems, coupled with prominent pastoral livestock and rain-fed agriculture sectors make Mongolia's economy, livelihood and traditional cultures highly vulnerable to climate change risks. At the same time, agriculture is the main emitter of GHG emissions in Mongolia and needs to be considered in a transformative perspective from that viewpoint as well.

The economy collapsed dramatically since 2012 because of falling commodity prices. Apart from the traditional livestock sector, which is oriented towards the domestic market, the mining sector was the least affected. Raw material exports are by far Mongolia's most important source of income and therefore, in agreement with China, ways were found to maintain raw material exports even in times of border closures. The next table presents basic demographic indicators for Mongolia.

Table 4. Basic demographic indicators (Our World in Data, 2024)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Population (million people)	2,74	2,79	2,85	2,9	2,96	3,03	3,1	3,16	3,23	3,29	3,35
Poverty (% of population) [2]	33,7	27,4	-	21,6	-	29,6	-	28,4	-	27,8	-
Gini Inequality Index	0,41	0,34	0,34	0,33	0,34	0,33	0,33	0,33	0,32	0,32	0,31

Mongolia experienced a significant increase in population over the past decade, from 2.74 million people in 2011 to 3.35 million in 2021. During the same period, the poverty rate was reduced slightly and the Gini inequality index improved somewhat.

Regional Level

Nalaikh is one of the nine districts of Ulaanbaatar and it is around 35 km away from the centre. By March 2022, 41,628 individuals and 10,405 households living in the district. A significant 34% of the population were registered as minors: 10% aged 0-5, and 24% aged 6-17. Adults between the ages of 18 and 65 comprised 60% per cent of the population, while elderly persons (aged over

2 Share of population living below national poverty lines.

65 years) comprised 6% per cent. Mining is an essential part of Nalaikh's history and identity, for a detailed description of the development of mining in Nalaikh, see chapter 6.2 regional level.

The main factor for the rapid growth of Nalaikh's population is migration. The migration itself and unregistered migrants have become pressing issues for the district. Immigrants are unauthorized to settle in the district where infrastructure is not developed or unsecured and it threatens their health and safety. 27.3% of Nalaikh households are under poverty line which is 13.600 people (36% of population). The number of social welfare recipients has increased 3.8 times over the past four years and the rate of welfare spending has increased 2.6 times. By 2019, 45% of the population are receiving social welfare, with an average annual welfare rate of 313.3 thousand MNT. Citizens tend to rely on the welfare provided by the government and avoid having steady jobs.

Back in 1922, when Nalaikh Mining became officially started by Mongolian Government, numerous individuals from various locations, particularly from the Western part of Mongolia, arrived in Nalaikh to work at the mine, leading to the expansion of the district. Therefore, those individuals can be considered as native to the area. The indigenous population, who worked in informal mining areas, were negatively impacted by the closures. After the major mining closed, all informal mining operations were also forced to shut by the government starting from the year of 2017, leaving workers unemployed. On several occasions, workers demonstrated outside the Nalaikh government office to protest against the closure. Otherwise, there is no record of conflict or other forms of violence.

The Government assisted these individuals in finding new employment, accessing training opportunities, and receiving health-related supports. However, their job losses were not fully addressed, and significant changes were not implemented.

5.2 Discourses, narratives and visions on coal and just transition

National Level

Heat and power supply over the long and cold winter period is essential for every Mongolian and its socio-economic prosperity. The average annual temperature is 0.2 °C and average winter temperature ranges between -10 °C and -30 °C. The country uses more than 90% of generated energy for heating purposes only, and approximately 57 % of the total heat generated is used for space heating and water heating in residential buildings only. 82 % of the installed power generation capacity is coal based; 17,5% on RE, 90 % of the domestic power generation comes from coal plants. 30 % of the Mongolian population live in *ger areas*, where unimproved individual coal stoves are used by most residents during winters, which generate high air pollution.

Due to the increasing air pollution and the health impacts, the public is aware of the negative effects of raw coal on pollution. Thus, air pollution becomes the main driver for a heat transition away from raw coal to refined coal for heating. In long-term strategies, electric heating (mainly coal based) is named as a vision for emission free heating.

Economic growth through coal exports, as well as cheap and reliable heat and electricity sources are the two main assets strongly linked in the Mongolian narrative when it comes to the coal industry. The need to change the "business model of the country" away from coal and its dependency of China's future energy mix is not present. On national level a coal phase in rather than a coal phase out (no underground coal mine closures since 2010, instead there have been nine new mines opened since 2015 (Global Methane Initiative, 2022)) has to be stated.

The past economic booms in Mongolia were primarily fuelled by exporting coal to China. But the economic downturn caused by coronavirus pandemic and a strong decline of coal exports from which the economy has not yet recovered have led to a difficult situation. Present assumption on the state budget for 2023 are built on a massive increase in export volumes and estimated high market prices. If only one of these two input assumptions will play out a little less optimistic, the already tight state budget will be under extreme financial pressure. This showcases how undiversified the economic business model of Mongolia is, and that the country has not yet created the basis for a new large and future-orientated industrial sector. Despite the global trend, the coal strategy of Mongolia based on the plans of the Ministry of Mining is to increase the production as much as possible in the next ten years to turn coal into money and GDP growth. For now, besides the international NDC commitments, the domestic political narrative is not showing any indications that a shift towards alternative and profitable business models for the economy is on the horizon.

For the Mongolian people no alternative comes to mind when being asked for an alternative for heating or economic development. The global coal phase-out has not found its way into the major development policy papers of Mongolia (such as Vision 2050, New recovery policy 2030 and Government Action plan for 2020-2024). Even though most of the key decision makers are fully aware of contradicting the global trend of reducing coal use, this does not prevent the country from increasing coal exploration capacity. For the time being coal is the backbone of the economy, heat supply and also the state budget.

Just Energy Transition is known by key decision makers from international discussions, within the country the term is not used or implemented. The same tendency can be recognised by the workers and unions. The decision makers within the unions are aware and - due to the global exchanges - relatively well informed about just energy transition. However, the point to become active and also take on the important role of unions within a Just Energy Transition process has not been reached. Therefore, the entry point of any JET related processes should be based on general climate change commitments of Mongolia to reduce GHG emissions and should be addressed accordingly.

Regional Level

The following chart illustrates the historical development of coal mining in the Nalaikh district.

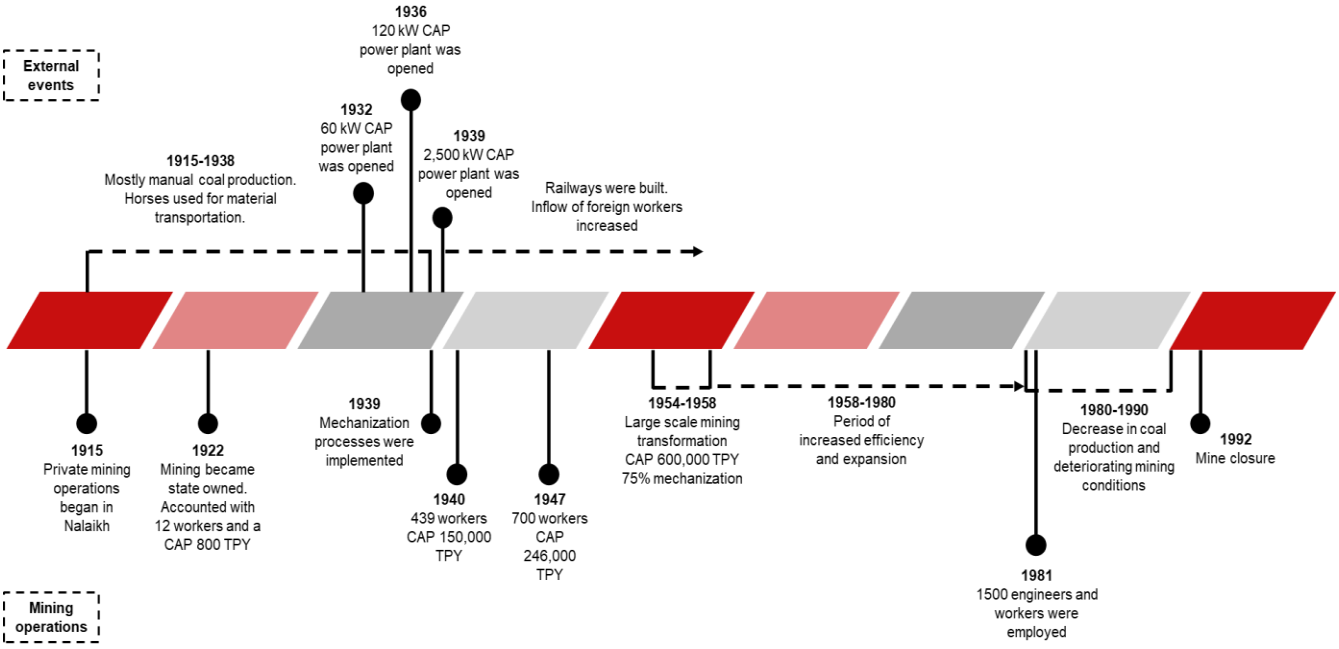

Figure 11. Historical development of coal mining in the Nalaikh district

Source: Author's diagram.

Nalaikh' starting position

Mining at Nalaikh, dates back to 1922 and is the reason for this year's 100 years anniversary of coal mining in Mongolia. The district was home to Mongolia's first state mining company which started operation in the 1950s, employing as many as 1,500 people. With the post-communist economic crisis, the mine collapsed in the 1990s. During that time Nalaikh mining was considered almost as the most dangerous place, yet with little government oversight, hundreds of informal miners excavated coal there.

After the formal closure of the site in 1992 and surrounding industries, masses of freshly unemployed and skilled miners turned to so called artisanal miners or illegal mining. It was a local production to fulfil the demand of raw coal for ger district households in Nalaikh and UB city by 1994. The government attempted to regain some control by issuing licenses for operations for around 36 small companies in Nalaikh. There used to be about 200 shafts and each shaft had a minimum of 10 workers, excluding the drivers, middlemen and resellers.

Thus, even after the official closure, mining was the main job source and economic contributor in the district of Nalaikh.

Even in 2011 the Nalaikh mine still held about 30 million tons of coal. As the work was informal, the exact number of workers is difficult to pinpoint, but estimates about 2,500 people worked at Nalaikh in 2011 during the peak season from September to May. There were considerable security risks in this way of mining with regular accident, this caused the final closure in 2022. The closed mining area stays without any reforestation which causes significant harm to the environment and people.

Status of coal dependency in Nalaikh

Despite having phased-out mining, Nalaikh's economy is still linked to coal in the following areas:

1. **Electricity production:** Nalaikh depends 100 % on electricity imports from the national grid (90 % coal fired production); Small RE park (wind and solar) is not functioning and not connected to the grid.
2. **Heat production:** Nalaikh district depends 100 % on coal imports from Baganuur via truck for the central heating system.
3. **Refined coal for heating:** Nalaikh is home of one of two factories in the country to produce refined coal for decentralised residential heating, supplying the national demand (mainly the *ger* districts in Ulaanbaatar after the ban of raw coal in UB city 2021).
4. **Migrant work:** Former artisan miners are now working on seasonal contracts in other mining areas.

Stages of phasing out coal in Nalaikh

Being the first district in Mongolia where the development and growth has been heavily impacted by coal mining, Nalaikh at the same time is also the first district that already entered a major economic transformation away from coal mining. Thus, the economic situation and need for diversification is very different from other districts and the national level. The national economic plans and political strategies are all merging into a scenario of increasing coal exploration and exports to China for the next 10 years whereas Nalaikh already officially phased-out coal mining in 1992 (phase 1) and banned informal coal mining in 2022 (phase 2). The phase-out in 2022 had a relatively low impact for the official economical figures. However, in a microeconomic perspective, it destroyed the income source for the former mining families (declining of over 2000 families in the period from 1992 until 2010 to around 500 families in 2022).

5.3 JET related SWOT (society)

Table 5. JET related SWOT society

Strengths:	**Weaknesses:**
National: Democratic political system and vibrant civil society are an asset for a JET process. Key actors have a basic awareness that in the mid- and long-term they must take steps for phasing-out due to the heavy climate change impacts in Mongolia and potentially due to increasing international political pressure and restricted access to finance. **Regional:** Nalaikh officially phased-out (closed) coal mining. Nalaikh as a compact district is very suitable for piloting of JET model projects (green jobs e.g. mining area for regeneration, RE and forestry projects). Well-organised community of former miner workers exists in Nalaikh district, some activities implemented (regeneration of old mining area, construction of an event stadium with own resources).	**National:** Coal-mining as well as heat and electricity generated by coal seem to be deeply rooted in the present narrative of successful development and prosperity in Mongolia. High risks of economic downturn due to the dependency on a coal-based development model in a global political situation aiming at phasing-out coal in the long run are accepted. Key actors and stakeholders hardly see any possibility for phasing-out coal now. Dependent on Russia for energy supplies. Small population. Dependent coal exports to China. Unplanned and bad infrastructure of the capital city. **Regional:** The current social protection programmes in Nalaikh do not specifically target former miners. JET is currently not part of the national and local development strategy papers. Migrant work: Former artisan miners are now working on seasonal contracts in other mining areas.
Opportunities:	**Threats:**
Regional: Economic diversification opportunities due to its proximity to the capital city and tourist destination.	**National:** Landlocked between 2 big countries which blocks other opportunities to diversify economy e.g exports, imports. Mongolia's economy, livelihoods, and traditional cultures are highly vulnerable to climate change risks due to its geographic location, extreme weather, and fragile ecosystems, as well as the prominence of pastoral livestock and rain-fed agriculture sectors. **Regional:**

	High chance of poverty due to unemployment and underdeveloped infrastructure. Not reforestation to former mining areas causes climate hazards and health issues. Poverty might force former miners to quarry coal illegally.

Main driver: Nalaikh's official coal phase-out of 1992 and ban of informal mining in 2022.

Main barrier: Coal is still the backbone of Mongolia's economy and heat supply.

6 Governance

6.1 Political-economic context

National Level

In Mongolia, 36 political parties are registered with the Ministry of Justice. Until the 2012 elections, however, the party landscape was almost exclusively dominated by two parties: the Democratic Party (DP) and the Mongolian People's Party (MPP) which has increasingly constrained the development of a multiparty system. In the last two decades, money and personal wealth have become increasingly influential in the Mongolian party system. Consequently, frictions and political bargaining between lobby networks have led to political instability and unpredictability. Public trust in political parties reached historic lows in recent years.

All parties in Mongolia are highly personalised. Personal antagonisms or sympathies and personal economic interests as well as supply networks tied to leaders are often decisive for political processes and alliances. Mongolian parties and politicians often succumb to the temptation of campaigning with populist demands and material promises that are difficult to keep. The "oligarchisation" of parties is a serious problem in Mongolian politics.

Since the parliamentary elections in June 2016, the former state party MPP, founded in 1921 and oriented towards social democracy, has been the ruling party. In the parliamentary elections in June 2020, the government was confirmed in office with a large majority of 62 out of the 76 parliamentary seats. The DP has eleven mandates. For the first time since 2009, the MPP controls all levers of power with parliament, government, and president. The next regular election on national level will be in 2024. The current situation (see also next paragraph) raises the likelihood of early elections.

Corruption. Corruption has become the major obstacle to prosperity in the country. While significant legal and institutional frameworks, such as the Anti-Corruption Law and the Independent Agency against Corruption, were put in place in the last decade, the implementation of anti-corruption policy has been plagued by deep-seated conflicts of interest in politics. Fighting against corruption at lower levels of government has produced positive results, but justice remains elusive when it comes to prosecuting high-profile and political corruption. In addition to the challenge of corruption, where Mongolia ranks on place 116 of 180 in the corruption perception index (Transparency International, 2024), coal smuggling has presented an issue for the country. The People’s republic of China imported much more coal to its trade statistics than the official Mongolian export figures. Additionally, major corruption scandals have led to public protests in December 2022.

Despite the lack of a civil society tradition, Mongolia has a vibrant field of independent civic activism that includes NGOs, popular movements, independent journalists and social media influencers, all of which have been a crucial force against democratic backsliding. Mongolia's population is the youngest in Northeast Asia and its younger generation, which grew up in a competitive and free society, will likely further strengthen the country's civil society.

International climate commitments

On the international level Mongolia has a firm commitment to environmental and climate action. In November 2020, Mongolia submitted its updated Nationally Determined contributions (NDCs) to the United Nations Framework Convention on Climate Change (UNFCCC). Mongolia has set a new target of reducing its greenhouse gas (GHG) emissions by 22.7 % by 2030. This new mitigation target, which excludes land use, land use change and forestry (LULUCF), is an improvement on a 14% goal from its earlier intended NDC. The updated NDC includes additional sectors that were not previously considered, such as agriculture, waste, and several industrial sectors. In the energy sector, Mongolia intends to increase the use of renewable energy sources (20 % in 2023 and 30 % in 2030) and improve efficiency of energy production. Mongolia has not committed on international or national level to a coal phase-out, neither for energy production nor for exporting coal.

Vision 2050 and Governmental Action plan 2020-2024

A new long-term, development strategy, known as Vision 2050, has been approved by the Mongolian Parliament in early 2020. According to Vision 2050, the fundament of Mongolia's long term development policy is green growth, and the country's economy and infrastructure will be developed based on its potential of natural resources and advantages of geographical location. The long-term development policy of Mongolia has nine fundamental goals and 50 development targets, focusing on economic growth and social development. One of the nine goals is governance, which includes justice, with the declared objective of ensuring the independence of the judiciary. Each goal is split into three phases: phase I from 2021-2030, phase II from 2031-2040 and phase III from 2041-2050.

The Vision 2050 contains one chapter on Green Development, which is divided further in:

1. Nature and Ecosystem
2. Benefits from natural resources
3. Water
4. Low Carbon, productive and inclusive green development

While Mongolia on a national level included climate change as a factor in policy formulation across agencies and ministries, the government has no specific green investment plan but very general environmental policies. Mongolia's 2020-2024 action plan includes issues related to

climate change and references to the establishment of a green financing system. Regarding policy efforts to achieve net-zero carbon emissions by 2050, the government has offered neither policy recommendations nor specific regulatory or legal measures for carbon reduction. Consequently, the government has no expectations that the private sector will undertake measures to achieve net-zero emissions. More broadly, the government continues to examine ways to incentivise preserving biodiversity, particularly through eco-labelling and tax credits.

Because the energy and mining sector‘s centralized structure, it is the only sector in the Mongolian economy where the market conditions are not enforced and decision making processes are not inclusive. All major energy generating plants, transmission and distribution networks are owned by state owned companies. Thus, all energy tariffs are heavily subsidized and not consumption oriented which are hindering the efficient development of the sector. International organization such as USAID and ADB have been working on the improvement of the governance in Mongolia’s energy sector.

Just Energy Transition Unit

The Ministry of Energy established JETU (Just Energy Transition Unit) in October 10th, 2023 to oversee and manage initiatives related to the just energy transition. JETU was established to develop a roadmap for the long term to meet the targets and objectives of Vision 2050 Mongolia, of the Paris Agreement, and of the National Determined Contributions.

The unit is supervised by the head of the Policy and Planning Department of MoE. Currently, the unit is collecting data and learning from international best practices.

Regional Level

The key institutions on the regional level in the Nalaikh region are the Nalaikh Governor’s Office and Citizen’s Council and the Parliament of Nalaikh district. The Citizens’ Council has 25 elected members and 6 Standing committees in charge of different topics. The Standing Committees are:

1. Urban planning and environment
2. Social policy and development
3. Legislation and governance
4. Committee for budget and economic development
5. Committee for citizens inclusion and cooperation
6. Committee for digitalization, innovation development

Nalaikh is one of the 9 districts of the capital city Ulaanbaatar, which is why the Governor's Office of the Capital city and the Citizen's Council of the capital City are key local political institutions for the region.

The **key governance instruments** for JET on local level are:

- Action programme of the district governor for 2020-2024
- Local development plans and strategies
- Yearly Action plans of the district Governor's Office

The **Action program of the district Governor** for 2020-2024 includes six Chapters and 231 measures. These are:

1. The policy to overcome the socio-economic challenges caused by the pandemic "COVID-19" /10 measures/
2. Human development policy /51 measures/
3. Economic development policy /43 measures/
4. Governance policy /27 meaures/
5. Green development policy /34 measures/
6. Capital city and region, local development policy /66 measures/

These key policy and strategy documents do not directly support the JET processes on coal phase-out, however, there are number of actions which are relevant for JET.

For example, Chapter Two of the Governor of the Nalaikh district's Action Programme for 2020-2024 aims to enhance adequate employment opportunities. This involves facilitating citizen access to permanent and temporary jobs in national and regional large-scale projects concerning mining and construction. These projects include the Railway, Construction Materials, Industrial Technology Park, Improved Fuel Factory, and opportunities for decent labour to decrease the unemployment rate. Also, to align with the objectives of major developments and district development plans, the labor market and align with objectives of major developments and district development plans, it is important to offer workplace support to graduates. Also standardizing the workplace and hygiene environment of factories and economic entities are operating locally, and ensure that no fewer than 90 % of the workforce are supplied with residents from the local area. In order to facilitate the Nalaikh district's labour market and promote the transition to decent employment, it is necessary to develop, approve, and implement measures targeted towards household manufacturers, small and medium-sized enterprises, and private entities that are tailored to the district's specific conditions. There is no active communities or civil rights

movement groups to bring their voices and demands in the district except the Nalaikh Mining NGO with the miners which is inactive since the mining closed. Citizens can directly address the district's governor to voice their concerns and initiate public hearings through Citizens representative Khural (a group of people elected from the citizens to represent them to bring their voices to government offices).

Because committees, districts, and capital issues cannot be resolved by citizens as a whole, citizens elect representatives to participate in government activities. The representatives are expected to act on behalf of their constituents and ensure that their interests are taken into account. It is therefore crucial that citizens exercise their right to vote and hold their elected officials accountable for their actions. However, these voices are not formalised and often concerns are not addressed in their entirety.

6.2 JET related SWOT (governance)

Table 6. JET related SWOT governance

Strengths:	**Weaknesses:**
National: Commitment to environment and climate action within NDCs, Action Plan and Vision 2050. For example: new mitigation target of reducing GHG by 22.7% by 2030 in Action Plan. Democratic political system and vibrant civil society are an asset for a JET process. **Regional:** Officially coal mining has already been phased out in the Nalaikh region. The Action program of the District Governor 2020-2024 aims to create opportunities to develop more decent jobs.	**National:** Elections and political decisions are highly dependent on individuals and their personal objectives and economic interests. No specific national or international plan for a coal phase out neither for energy production nor for exporting coal. No net-zero long-term Strategy or JET funds are on the political agenda. Corruption is a major challenge in Mongolia, particularly within the dominant parties, which rely on patronage, leading to widespread corruption. **Regional:** Policies are dependent on national regulations. No concrete plan or regulation on reforestation of closed mining.
Opportunities:	**Threats:**
National: The President of Mongolia attended The United Nations Climate Change Conference	**National:** Close connections between corrupt politicians hinder other politicians to push for change.

in 2022 and he launched a nationwide movement to plant 1 billion trees by 2030 which is in progress now. Clear goal to achieve an independent jurisidiciary system in the Vision 2050. **Regional:** Public hearings are possible and happening, with potential for more formal citizen inclusion. Small groups of citizens are active and motivated to engage in politial dicussions. Nalaikh could be a model region for others in Mongolia that still have coal.	**Regional:** A new coal based thermal plant is planned to meet rising demand.

Main driver: Commitments laid down in Action Plan 2030 and Vision 2050

Main barrier: Highly dependent on coal, vast source of coal, corruption

7. Economy and Employment

7.1 The role of coal mining and coal trade

National Level

In the following, we will first briefly show basic economic indicators and then discuss the role of the Mongolian coal industry in the Mongolian economy.

Table 7. Basic economic indicators (Our World in Data, 2024)

Year/Indicator	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
GDP Billion US$	7.19	10.4	12.3	12.58	12.23	11.62	11.18	11.48	13.18	14.21	13.31	15.1	16.81
GDP Per capita US$	2.660	3.794	4.402	4.422	4.212	3.919	3.691	3.687	4.147	4.405	4.061	4.535	4.107
Economic growth (the rate of change of real GDP in %)	6,4	17,3	12,3	11,6	7,9	2,4	1,5	5,64	7,74	5,6	- 4,56	1,64	4,8

After Mongolia went through a phase of high economic growth due to the expansion of mining at the beginning of the 21st century, the country entered an economic crisis from 2012 onwards because of falling commodity prices. Economic growth collapsed dramatically. Unemployment and poverty increased, and the state suffered from low revenues. In spring 2017, Mongolia was threatened with national bankruptcy, which could only be averted with a rescue package from the International Monetary Fund (IMF) and other international donors. The economic recovery that began in 2018/2019 was abruptly interrupted by the coronavirus pandemic; in addition, foreign debts will have to be serviced on a large scale from 2021.

The economic and social impact of the coronavirus pandemic has affected the different sectors of the Mongolian economy, which is only integrated into regional and global value chains as a supplier of raw materials, to varying degrees. In 2020, the Mongolian economy shrank by nearly 5%. The loss of jobs cannot be precisely quantified due to the high number of informal workers. The Mongolian Chamber of Commerce and Industry estimates that about 150,000 people lost

their jobs because of the coronavirus pandemic (Mongolian National Chamber of Commerce and Industry, 2022).

Apart from the traditional livestock sector, which is oriented towards the domestic market, the mining sector was the least affected. Raw material exports are by far Mongolia's most important source of income and therefore, in agreement with China, ways were found to maintain raw material exports even in times of border closures.

Over the last 30 years, Mongolia evolved into a dynamic democracy, increasing its GDP per capita three-fold since 1991. While the country achieved significant strides in alleviating poverty in the last decade, its growth has been erratic and sluggish in recent years. Creating employment opportunities, particularly among the youth, continues to be a pressing issue for the nation. With extensive agricultural, livestock, and mineral resources, as well as an educated population, Mongolia's development prospects appear promising in the medium to long term, relying on the implementation of structural reforms. In 2022, 25 % of Mongolias GDP was generated by the mining sector in general and 7.4 % of GDP of the coal industry in particular, which shows the outstanding economic importance of mining for Mongolias economy (National Statistics Office of Mongolia, 2022). The contribution of agriculture to Mongolia’s economy has declined in recent years, constituting 13,2 % of GDP in 2021, compared to the 50 % contribution from the service sector. Although agriculture accounted for about 38 % of GDP in the mid-1990s and was at an interim low of about 10% in 2010, agriculture and particularly livestock herding still remain important employers and sources of subsistence for a large proportion of the population, but also represent a vulnerability. Coal is currently the backbone of Mongolia's economy, heat supply, and also the state budget; a more detailed discussion of this will follow below.

Mongolia has vast coal resources within 15 large-scale coal bearing basins. There are around 320 coal deposits and occurrences (80 deposits and 240 occurrences). The country ranks 17th in the world in terms of coal production and has 307 licenses, 29 hard coal mines, and a total of 44 mines. Before the outbreak of the coronavirus pandemic in 2019, a record-high of 57.128.600 tons of coal were mined in Mongolia. Last year, Mongolia accounted for 26 % or 14 million tons of China’s import of 55 million tons of coal (Mineral Resources and Petroleum Authority, 2024). Total geological coal resources are estimated at approximately 150 billion tons, including about 20 billion tons explored. Major coal deposits are located in Tavantolgoi, Ulaan-Ovoo, Tugrug nuur, Tsaidam nuur, Baga nuur, Shivee-Ovoo, Nariin sukhait (Badarch/Namkhainyam, n.d.).

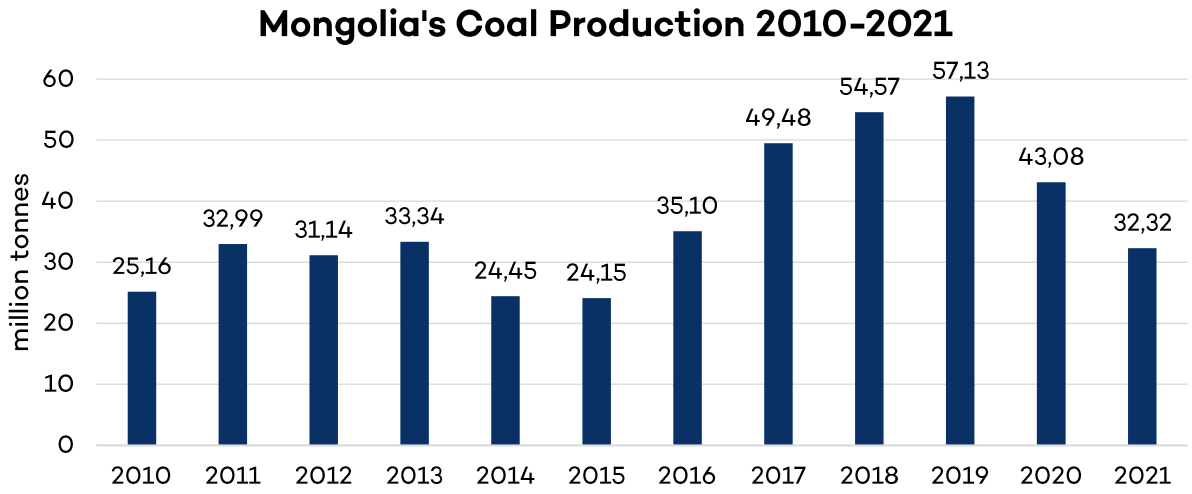

Figure 12. Mongolia´s coal production from 2010-2021

Source: Mineral Resources and Petroleum Authority (MRPAM), 2024

The coal industry produces about 40 million tons of coal on average per year, and exports more than 30 million tons for metallurgical purposes. 90% of coal exports are supplied by four large mines with an annual capacity of up to 10 million tons, and these mines are located in the southern regions near the border to China. Estimated coal reserves are 37.2 billion tons (World Mining Congress, 2022). Mongolia has substantial high-quality coking coal reserves and is on track to become one of the world's largest coal exporters. There are also substantial thermal black coal deposits as well as lower quality brown coal deposits.

Current economic growth is highly depended on coal **export to China** as (almost) the single buyer. The border closure during the coronavirus pandemic (2020, 2021) caused a steep decrease of coal exports and an economic recession with negative growth rates in 2020 and a slowly recovering economy in 2021. As of statistic data of the Ministry of Mining and Heavy Industry, the share of coal exports in total coal production was 49.3 % in 2021 and 64.4 % in 2019 respectively (see table below). As of end of 2021, 92.7 % of coal exports went to China and 6.1 % to Singapore.

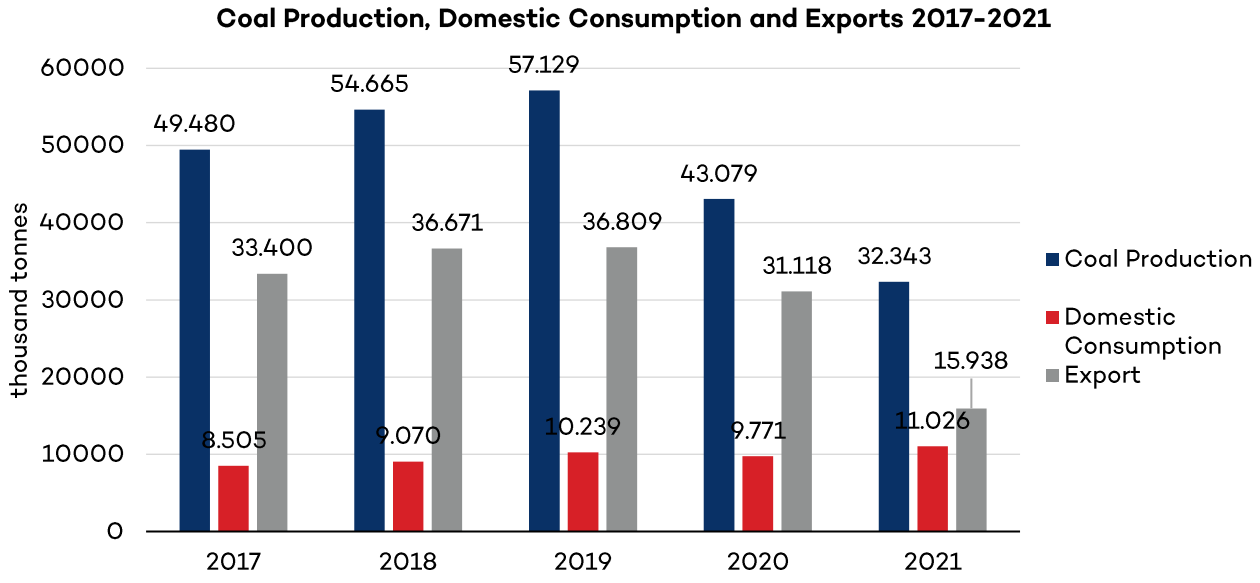

Figure 13. Coal Production, Domestic Consumption and Exports 2017-2021

Source: MRPAM, 2024.

Data on the trend of coal production show a increase from 2017-2019 and cutbacks due to the coronavirus pandemic between 2020-2021. The cutbacks in coal production due to the coronavirus pandemic seem temporary, an increase in the coming years is to be expected due to the plans of the Government to strengthen coal exports. Domestic consumption over the last 5 years is quite stable. Presently, on the national level a **coal phase in rather than a coal phase out** is to be stated (no underground coal mine closures since 2010, instead 9 new mines have been opened since 2015). The meaning of coal for energy generation is presented in chapter 9. While the Mongolian government has undertaken several rounds of privatizations since the end of socialism, the state remains a major commercial participant in the mining sector.

Regarding environmental impacts of the coal industry, people concern that coal and copper mining in Mongolia is threatening the livelihoods of herders and straining water supplies, as some mines are being developed without sufficient scientific information about the potential environmental and social impact of the operations. Towns located near the mines lacked adequate services and infrastructure to handle their burgeoning populations, it said, while increased coal dust caused by mining and trucks was exacerbating desertification and the decreasing quality of vegetation, as well as fueling the number of asthma and bronchitis cases in the area. Most of the area where coal is mined is a home for many endangered plants and animals and the mining caused them to extinct.

Coal is not only used for power generation, but is also used burnt directly for heating and cooking purposes in so-called ger districts (unplanned and provisionally laid out outskirts of Ulaanbataar

and other cities, created by the rapid and intensive movement of previously nomadic populations into cities.

Regional Level

Mongolia's largest underground coal mine, Nalaikh, was closed in 1992 due to a major mine fire. Small shallow depth mining at coal outcrops at Nalaikh began in 1922, for the purpose of supplying coal to customers of the capital city of Ulaanbaatar. In 1954 – 1958, the larger underground mining operations were established with the production capacity of 600 thousand tonnes annually. By 1987, the mine reached full capacity, producing 800 thousand tonnes per year. Official underground mining in this area ceased in 1993; however, after the formal closure of the underground mine, the masses of freshly unemployed and skilled miners turned to illegal mining of the Nalaikh deposit. With nearly 200 shafts and five to ten workers per shaft, there were roughly 2,500 miners working the area during the peak season between September and May (Eurasianet, 2011).

Despite having the coal mine closure, Nalaikh's economy is still dependent on coal in the following areas:

1. **Electricity production:** Nalaikh depends 100 % on electricity imports from the national grid (90 % coal fired production); Small RE park (wind and solar) is not functioning and not connected to the grid.
2. **Central Heat production:** Nalaikh district depends 100% on coal imports from Baganuur via truck for the central heating system.
3. **Refined coal for decentralised heating:** Nalaikh is home of one of two factories in the country to produce refined coal for decentralised residential heating, supplying the national demand (mainly the *ger* districts in Ulaanbaatar after the ban of raw coal in UB city 2021).

Ecological regeneration and future opportunities for coal region

The regeneration of the former mining area is ongoing, every year some money from the district budget goes into the regeneration activities. The process and the activities are not fully structured. Nevertheless, based on the Vision 2050 and the new recovery plan until 2030 the district of Nalaikh has - based on its territorial assets - defined a future economic growth plan, with five main areas:

1. Tourism: renaturation of mining area, plus industrial museum (idea and plan)
2. logistics,
3. agriculture (food production and livestock),

4. SME (Small and Medium Enterprise) development (NGO is existing and the Delegation of the EU has a SME programme to accelerate SME development),
5. Industry Park for building material.

7.2 Employment situation

National Level

Over the past two decades, Mongolia has had sustained economic growth, labor productivity has increased, and a significant number of jobs have been created. Structural changes that mark a modernizing economy have been a progressing urbanization while an increasing number of workers has moved from agriculture into industry and especially services. At the same time, the country has also benefited from low dependency rates, and the working-age population is increasingly well-educated. Even though the COVID-19 pandemic had significant negative impacts, the economy has started to recover in 2022 and, with it, the prospects for resuming job creation. However, it is worth noting that the country will face job-related challenges in the future. There are two major labor market challenges in Mongolia. The first and overarching employment challenge is to create more and better jobs than have been created during the past decade. The growth of labor demand has not been strong enough to reduce unemployment. Many of the jobs that have been created are in relatively low-paying sectors. The second employment challenge relates to inclusion; this includes raising labor force participation for specific groups and creating more opportunities for young people. Mongolia's labor force participation rate is particularly low for women, urban residents, and people with intermediate levels of education. The youth are facing difficulties in their transition into the labor market, and their unemployment rate is high, as can be seen in the table below. Overcoming these challenges will require a jobs strategy that is multi-sectoral and takes a whole-of-government approach. The following table shows the rates of unemployment in Mongolia, broken down by gender.

Table 8. Unemployment rates Mongolia (The Global Economy, 2024)

Year/Indicator	2015	2016	2017	2018	2019	2020	2021	2022
Unemployment rate (% of labor force)	4,86	7,24	6,36	5,38	5,44	6,59	7,75	8,25
Female unemployment rate	4,24	5,88	5,65	4,82	4,89	6,3	7,31	7,8

Year/Indicator	2015	2016	2017	2018	2019	2020	2021	2022
Male unemployment rate	5,38	8,39	6,97	5,83	5,9	6,82	8,10	8,62
Youth unemployment	12,75	20,19	17,48	16,46	16,09	15,88	17,43	19,37

Mongolia's relatively low levels of labor productivity compared to its peers, high degree of volatility, slow capital deepening, and reliance on the mining sector pose challenges for future job creation. Although labor productivity growth has been substantial, Mongolia's levels of labor productivity are not necessarily high when benchmarked against its structural peers. Capital per worker has grown slowly on average and is heavily concentrated in the mining sector, which, despite its importance to the economy, employs just a small share of the working-age population. Investment mostly has been financed through foreign direct investment (FDI), which moved in parallel with improved terms of trade. The rise and fall of capital inflows, which are tied to trends in Mongolia's commodity markets, have brought volatility to the overall economy, which, in turn, has slowed per capita growth since 2014.

Mongolia has achieved significant progress in human development and economic growth, with the latter driven by heavy reliance on the mining sector. The economic growth over the last decade (before the COVID-19 pandemic), however, has had a limited impact on increasing sustainable jobs and reducing poverty and income inequality. The labor market continues to be challenged by the seasonality of many economic sectors, limited structural upgrading, and significant unemployment and inactivity, particularly for women and youth. These challenges are, ultimately, of a structural nature and will require a vibrant, diversified, and growing private sector that creates a sufficient number of productive and well-paying jobs. Mongolia has had success in creating private sector wage jobs, but creating more productive and higher wage jobs remains a challenge.

Approximately 360,000 workers in the informal sector were highly affected by the restrictions during the coronavirus pandemic. These mostly contact-intensive jobs as taxi drivers, market traders, kiosk operators or in the body-related service sector (e.g. hairdressers, beauticians) were particularly severely restricted. Since informal workers usually do not have large reserves and depend on daily income for their livelihoods, many informal workers and their families were already facing livelihood difficulties in spring 2020. The situation was aggravated by the fact that the Mongolian government's extensive rescue and support packages were primarily aimed at the official sector. For example, income tax was temporarily suspended, and social security

contributions were reduced in order to limit job losses in the private sector. Informal workers could only benefit from increased child benefits and food stamps.

Work force in the mining sector as of end 2018

Table 9. Work force in the mining sector as of end 2018 (MRPAM, 2024)

Position	Core company	Sub-Contractors	In total
Engineers and technicians	5,772	8,353	14,125
Management staff	2,878	2,253	5,131
Operators	14,388	5,448	19,836
Others	9,121	8,422	17,543
Workers in total	32,159	24,476	56,635

In 2018, the Mineral Resources and Petroleum Authority conducted a study on the work force of the mining sector. The study revealed that a total of 56,635 people worked in the industry, with 32,159 working in the main companies and the remainder in subcontracting companies. Of the total workers, 25 % are engineers and technicians, 9% are at a managing level, 35 % are operators, and the rest are in other positions. 96% of the mining industry's workforce comprises local individuals, with the remaining 4% comprising expatriates. Furthermore, the industry employs 90% male and 10 % female workers (MRPAM, 2024).

Figure 14. Share of employees in the mining sector by gender
Source: MRPAM, 2024

Coal mining stands for a big part of the Mongolian mining activities. As of end 2021, state budget revenues from the whole mining sector were 3.845,5 billion MNT. Of this, the revenue from the coal sector was 756,9 billion MNT or 19.7 % (sharp decrease due to negative coronavirus pandemic (2020, 2021) impacts). Whereas in 2019 it was 41.4 % (before coronavirus pandemic).

When we talk about jobs that will be affected by a JET, we can state the following: **Directly affected** will be, in general, jobs in the fossil fuel industry, particular in coal, production, treatment, usage, and transportation are directly impacted by JET as these sectors may shrink or undergo significant changes. That indicates that jobs in the renewable energy sector such as solar, wind, and hydropower, grid integration, energy storage, etc. are directly created or expanded during a just energy transition. Furthermore, energy efficiency specialists involved in energy-efficient technologies and practices e.g. in construction and/or manufacturing, including energy auditors and insulation installers, are expected in higher demand. That also applies for environmental scientists who can assess and evaluate the environmental impact of projects regarding a just energy transition. The maintenance of (imported) electric vehicles and the establishment and maintenance of charging infrastructure will create new jobs directly linked to the transition.

Indirectly affected will be jobs in companies that are trading components for renewable energy systems, EVs, and energy-efficient technologies will experience growth. The same applies for the construction and transportation sector which then also indicates a change in employment in the education and training sector both, on vocational and higher educational level, as well as in the field of innovation and research. Finally, a just energy transition also affects jobs on government level (policymakers) which are in lead of shaping the transition and in the financial sector which are providing sustainable investment schemes.

In the frame of the EU funded ”SDG ALIGNED BUDGETING TO TRANSFORM EMPLOYMENT IN MONGOLIA” project, a recent study on employment promotion policy, measures and analysis of the current state of financing was conducted in 2022 (UNDP, 2022). In short, Mongolia has instruments and measures in place and there is even diversified budget allocated (Employment Promotion Fund) to promote employment through targeted activities. Yet, the analysis on the actual state of activities and funding indicates that there are still challenges such as (selection):

- Structural unemployment is high in Mongolia despite economic growth.
- Demand for Technical and Vocational Education and Training (TVET) graduates exceeds that of higher education graduates.
- Need for improved TVET quality and responsiveness to market demands.
- Shortages of skilled labor specialists in the labor and welfare sector.
- Challenges in assessing project outcomes for future planning.

- Lack of support measures for enterprises and formal employment.
- Allocation of EPF budgets based on proposals, rather than local needs.
- Inefficiencies in EPF income sources and distribution.

However, there is only one indicator thematizing the support of green jobs within a program, but this is more about standard cost of planting, caring for and protecting trees. There are no findings in support of social groups potentially affected by a coal phase out. In this regard, the transition from a fossil fuel-based economy towards a low carbon green economy in general is not thematized in employment promotion activities.

A study on Employment in the Environmental Sector and Green Jobs in Mongolia in 2017 (Oyunbileg/Stoevska, 2017) indicates a significant employment potential in the environmental sector in general and nationwide. “Out of 374.1 thousand (33.1 % of total employment) employed in the environmental sector, 196.8 thousand, which represents 17.4 % of total employment, are considered as green jobs since those are environmentally friendly (reduce or eliminate pressures on the environment or to make more efficient use of natural resources) and pay decent wages (more than two-third of median earnings) in Mongolia in 2nd quarter of 2016”.

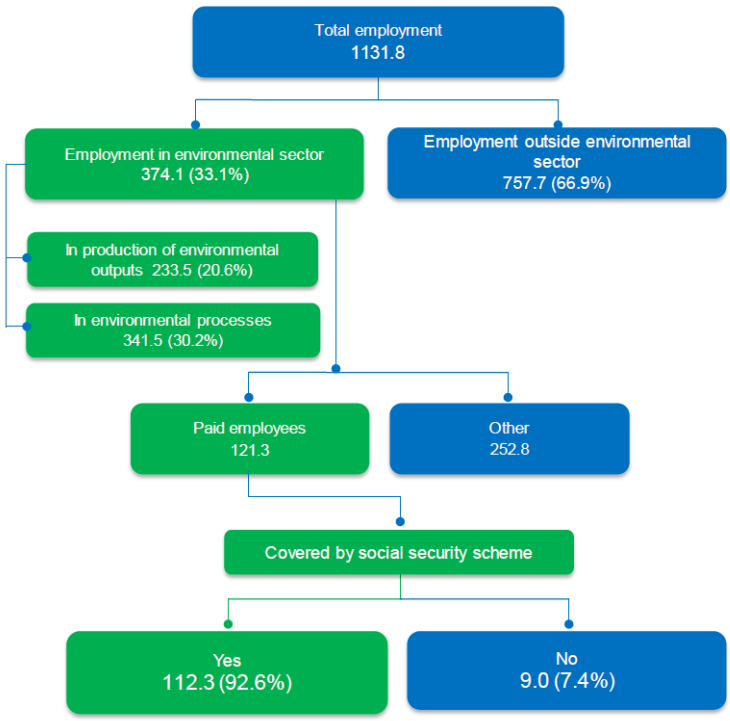

Figure 15. Scheme to defined green jobs in Mongolia, second quarter of 2016, thous. persons

Source: Author's diagram.

Regarding JET, a major part of employment in the environmental sector producing environmental outputs is allocated outside of the capital Ulaanbaatar and is within the agriculture sector. Seeing the number for JET related sectors such as renewable energies and energy efficiency there is an enormous lack of participation in employment in the environmental sector which will directly hamper the transition to a less harmful energy production and requires a comprehensive package of activities. For instance capacity building activities and training programs for experts to improve the integration of renewable energy sources.

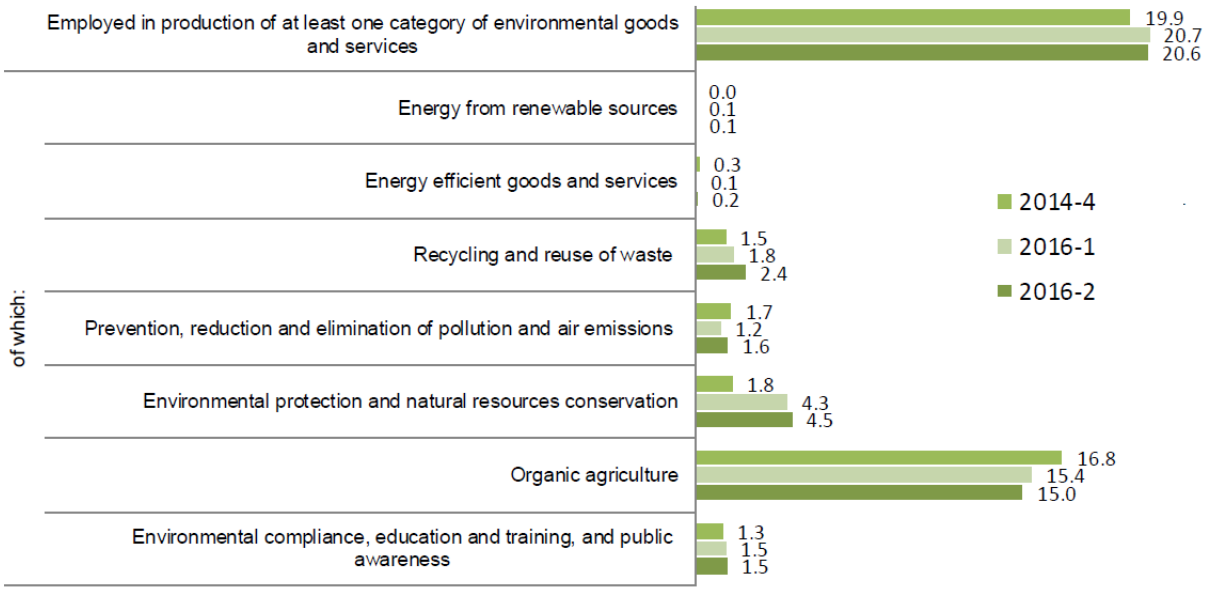

Figure 16. Employment in production of environmental, by category of environmental goods and services, (%)

Source: Author's diagram.

In terms of core labour standards, Mongolia has made significant progress in creating an enabling environment for national action against child labor, since the 1999 global initiative on the prevention of the worst forms of child labour began. Mongolia ratified following conventions: Worst Forms of Child Labour Convention, 1999 (No. 182) and Minimum Age Convention, 1973 (No. 138) in 2001 and 2002. In relation to these conventions, an amendment to the labor law, a list of jobs prohibited for minors (order A/36) and criminalization of the worst forms of child labor (Article 16, Criminal Code (2015)) came into force in 2016 (International Labour Organization, 2016). Mongolia has also ratified the Convention No. 155 on Occupational Safety and Health in 1998, Convention No. 176 on Safety and Health in Mines in 2015, and Convention No. 167 on Safety and Health in Construction in 2020. The ILO Convention Promotional Framework for Occupational Safety and Health Convention, 2006 (No.187), which is the only fundamental conventions yet to be ratified (ILO, 2023).

In addition, Mongolia updated its labor law in 2022 according to practices in other countries and ILO international standards. The reform brings labor laws in line with global norms, protecting worker rights meanwhile regulations remain flexible, encouraging job creation without unnecessary hindrances. The law recognizes diverse work arrangements, ensuring equal treatment for all workers. It supports working families, including paid paternity leave, reflecting changing family roles. The reform promotes gender balance in parenting and childcare responsibilities. Employers must grant parental leave, essential for gender equality and work-life balance (news.mn, 2023).

The Mongolian Government just recently dissolved the General Agency for Specialized Inspection (GASI) by 1.1.23 to reform and streamline government inspections in the private sector. The Agency was responsible for overseeing the operations of all businesses across the country in accordance with the labor law. Despite the importance of government inspectors in assuring corporate compliance with laws and safety standards and safeguarding the public from harm, GASI has a bad reputation for being one of the most corrupt government bodies. The responsibilities of the agency will be absorbed by line ministries. Overall objective is, besides reducing corruption, to create a more business-friendly climate in Mongolia with several reforms (Adiya, 2022).

Regional Level

The predominant sector of employment in Nalaikh district is mining and other industrial activities followed by wholesale and retail trade and herding, agriculture and forestry. Employment sectors in Nalaikh district therefore vary much from city-wide trends, where mining, quarrying and other industrial activities only accounts for 6 % and herding, agriculture and forestry accounts for an even lower 3 %.

Overall, 9,247 individuals (22 % of the district population) live in the areas which called ‘kheseg’ in local term where mining and other industrial activities are the most prevalent sectors of employment. 7,680 individuals (18 % of the district population) live in khesegs dominated by wholesale and retail trade; and 3,733 individuals (9 % of the district population) live in khesegs dominated by herding/agriculture/forestry.

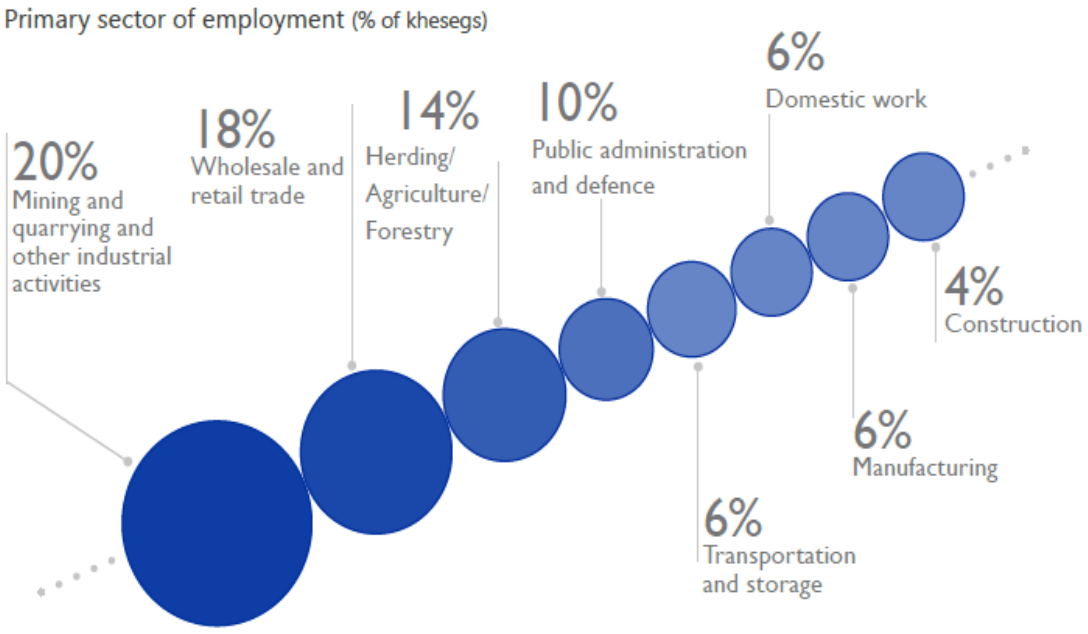

Figure 17. Private sector of employment in Nalaikh district by percentage

Source: IOM, 2022.

Across Nalaikh district, an estimated 8,044 individuals aged between 18 and 64 are out of employment, which is 32 % of the adult population. The out-of-work rate in this district is higher than the city-wide average of 30 % by two percentage points. The out-of-work rate is most critical in khoroo #6, where over two-thirds of the working-age population are out of work (69 %), followed by khoroo #3 (62 %), and khoroo #1 (49 %). In these three khoroos, 4,386 individuals out of a total of 7,577 working-age individuals are reportedly out of work. Conversely, the out-of-work rate is lowest in khoroo #8, where 99 % of the working age population are reportedly in work (3,559 out of 3,606 individuals), followed by khoroo #2 (85 %) and khoroo #4 (77 %). In these three khoroos, 9,682 out of a total of 11,232 working-age individuals are reportedly in work.

The Rapid Assessment on Population, Migration and Needs report for Nalaikh district from July 2022 (IOM, 2022) serves with relevant numbers on population, employment, and other indicators. However, a proper evaluation of employment in the environmental sector and the evaluation along ILO requirements for green and/or decent employment is not possible with the existing data and would require a more in-depth assessment of the employment situation in the Nalaikh region. Nevertheless, the collected data on the financial situation, challenges and security situation combined with a high unemployment rate indicates a general employment issue on regional level.

7.3 JET related SWOT (economy and employment)

Table 10. JET related SWOT (economy and employment)

Strengths:	**Weaknesses:**
National: Potential for diversification of production, notably agri-food (livestock, dairy products, meat, cashmere) and tourism. Working age population is well educated comparing to the elders. Availability of workforce (workers can move from the mining sector to the RE sector). **Regional:** The proximity to the city allows individuals to work in the city whilst residing in a quieter town. Advancing technical and vocational education is possible through the German-Mongolian Institute of Technology in the district, which provides more opportunities to educate local residents. Nalaikh's recovery plan until 2030 aims at regeneration of the former mining area and economic growth for several sectors (tourism, logistics, agriculture, SMEs, industry park).	**National:** Economy highly dependent on coal mining and coal energy sector; Coal is the backbone of Mongolia's economy as well as power and heat supply. In 2021, 50 % of produced coal was exported, of which 93 % was going to China; coal exports account for ca. 26,5 % of total exports of Mongolia; high dependency on Chinese market. Since 2015 Mongolia is rather expanding mining, use and export of coal than in a phase-out. Alarming level of corruption and weak governance (justice, public spending, state-owned enterprises, mining licenses and public procurement). The growth of labor demand is not strong enough to reduce unemployment. Most employment positions are not well-remunerated. Employees lack skills in technical sectors due to slow improvements in product quality and productivity. The job market will face challenges from seasonal economic sectors, limited structural improvements, and high rates of unemployment and inactivity. **Regional:** Despite the mining closure, the economy is still dependent on coal imports in the areas of electricity production, centralized and decentralized heat production. High rate of unemployment in Nalaikh.
Opportunities:	**Threats:**
National: The country possesses abundant mineral resources, which can be utilised for economic diversification or for export.	**National:** Mongolia's economy is highly dependent on coal mining sector.

Vast space and potential to create different sources for employment through developing different sectors e.g Renewable Energy sector, tourism. **Regional:** Location near to the capital city attracts more employees and allows them to work in the city whilst residing in a quieter town.	Vast coal resources that might be used for further economy and employment opportunities. **Regional:** Small and vulnerable economy, low standard of living. Unemployment and health issues caused by former mining areas to former mining workers.

Main driver: High potential to diversify the economy with renewable energy, diversified production and tourism.

Main barrier: State budget is highly dependent on coal mining sector, low standard of living, corruption

8 Energy – description of the energy sector

National Level

Context

In spite of its vast renewable energy potential, Mongolia depends on 90 % of total electricity production from coal fired thermal power plants. Coal is also being used as the primary source for heating. As a result, the energy sector becomes one of the major contributors to greenhouse gas emissions and serious air pollution in the country. The air pollution level in Ulaanbaatar and other towns have become worse than that in cities such as Beijing and New Delhi. UNICEF warned that this has become the public health crisis, especially among children. Nevertheless, the key decision makers and the policy framework do not project any reduction in the use of coal to meet growing domestic demand for electricity and heating (see chapter 6.2 on coal narrative). To be worse, the peak demand for electricity has almost reached the present generation capacity limit. In this situation, the country has overcome any power shortfall through more expensive power import from Russia. To cope with this critical situation, further investment, and timely development of new renewable energy resources as well as improvement in energy efficiency are required.

The country's heating and power infrastructure was constructed over 60 years ago and there is huge room for efficiency improvement. Growing heating demand in residential and commercial areas are met with energy generated at the Central Heating Plants (CHPs), Heat only boilers (HOB) and for the residential areas either improved coal burning (briquets) in sub-urban areas or raw coal burning in rural areas.

The power generation capacities of Mongolia for the past five years are shown in the following table. In 2022, about 82 % come from fossil sources, 81 % from coal and only 18 % from renewable energies.

Table 11. Power generation capacities [MW] (ERC, 2023)

Generation sets	2017	2018	2019	2020	2021	2022
Combined heat and power plants, coal based (MW)	1.110 (89,9%)	1.110 (85,1%)	1.145 (83,9%)	1.234 (81,5%)	1.269 (81,9%)	1.269 (81,1 %)
RE Sources (MW)	146,4 (11,9%)	216, 4 (16.6%)	214,2 (17,7%)	271,2 (18,3%)	271,2 (17,5%)	286,8 (18,3 %)

Generation sets	2017	2018	2019	2020	2021	2022
Diesel stations (MW)	2,3 (0,2%)	2,3 (0,2%)	2,3 (0,2%)	2,3 (0,2%)	8,6 (0,6%)	8,6 (0,5 %)
Total (MW)	1.258,7	1.318,7	1.361,5	1.507,5	1.548,8	1.564,4

Due to growing population and mining-centred economic growth, total installed capacity of the Mongolian energy system has more than doubled from 538 MW in 2001 to 1.564.4 MW in 2022 and still grew afterwards. The average annual increase of the energy consumption over the past 10 years is 5-7 %. As of 2022 the total capacity of Wind Power Plants is 155 MW, whereas Solar Power Plants account for 95.2 MW and hydro power for 36.6 MW. Electricity production and its sources are presented in the following table.

Table 12. Power generation mix [million kWh], 2018-2022 (ERC, 2023)

	2018	2019	2020	2021	2022
CHPs	6,152.4	6,346.6	6,493.6	7,109.6	7,428.5
Diesel energy generation	3.7	3.0	2.7	1.1	1.2
Solar energy generation	51.5	109.0	108.9	156.9	178.7
Hydropower generation	78.2	85.4	83.3	83.1	61.7
Wind power generation	339.0	459.3	457.2	563.0	508.5
Total generation	6,624.8	7,003.3	7,145.7	7,913.6	8,178.6
Imported (from Russia and China)	1,683.6	1,715.8	1,705.6	1,861.9	2,161.5

As the power generation mix in the table above shows, 90 % of the domestic production of power is based on coal, only 10 % comes from renewable energies. Despite its huge coal deposits and potentials for renewable energies, Mongolia imported 19 % of its total power demand in 2021. It should also be noted that Mongolia imports 100 % of its petroleum products, as there are no domestic refineries. The amount of power produced has been steadily increasing over the last five

years. Solar power and wind power saw the steepest increases, albeit at low overall levels. This is mostly due to newly built solar power plants in the Southern region of Mongolia, especially in Umnugobi, financed by international donors such as ADB. While the amount of power from coal increased at a lower rate, the share of hydropower decreased. Annex 1 shows a detailed list of power plants, including their capacities and locations etc.

Considering the main power consumers (total 6,838.8 million kWh) in Mongolia, the ERC statistical book of 2022 (ERC, 2023) provides the following distribution [million kWh]:

1. Residential sector 803.5 (11.8 %)
2. Ger districts (informal settlements) 1,332.5 (19.5 %)
3. Business, industry 4,700.8 (68.8 %)

The category Business/Industry needs a closer look, with the graph below showing the distribution of energy consumption (million KWh) among the different industrial sectors.

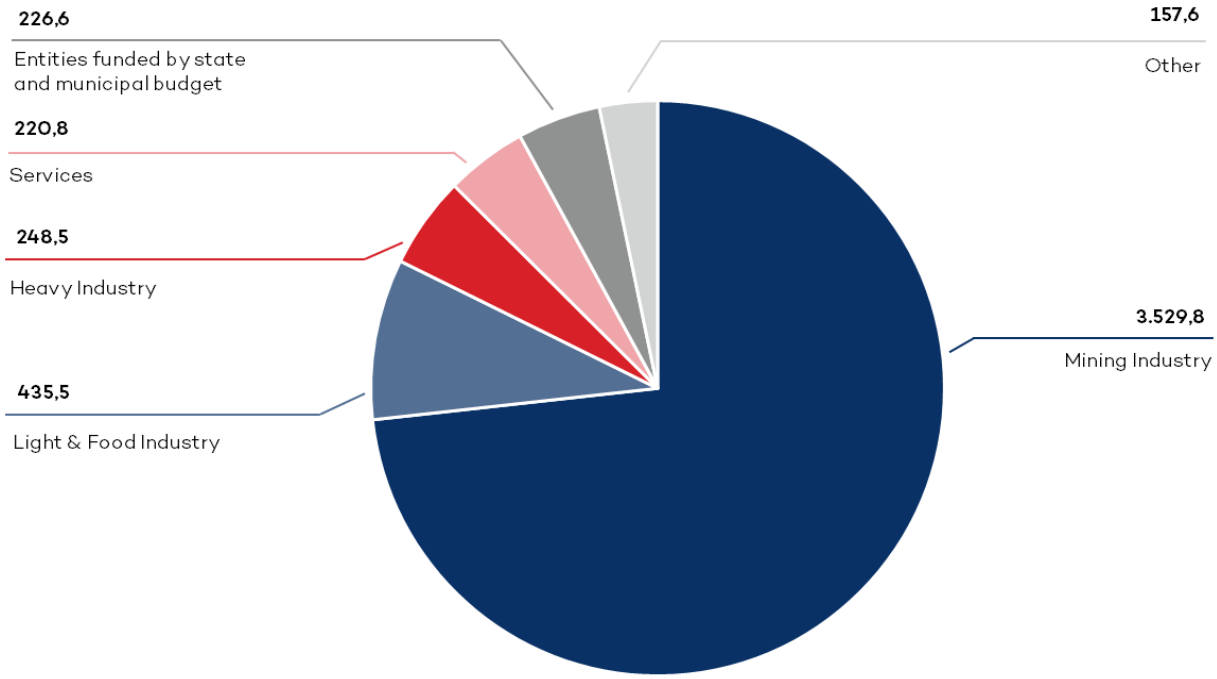

Figure 18. Energy consumption by sector

Source: ERC, 2023.

The biggest power consumer of Mongolia's main industrial sectors is the mining industry, which accounts for approximately 67 % of the total power consumption. Light and Food Industry account for 9 %, Heavy Industry for 6 %, all other rank at 5 % or below (ERC, 2023).

Power grid system

The Mongolian power grid consists of five systems, as the following figure shows.

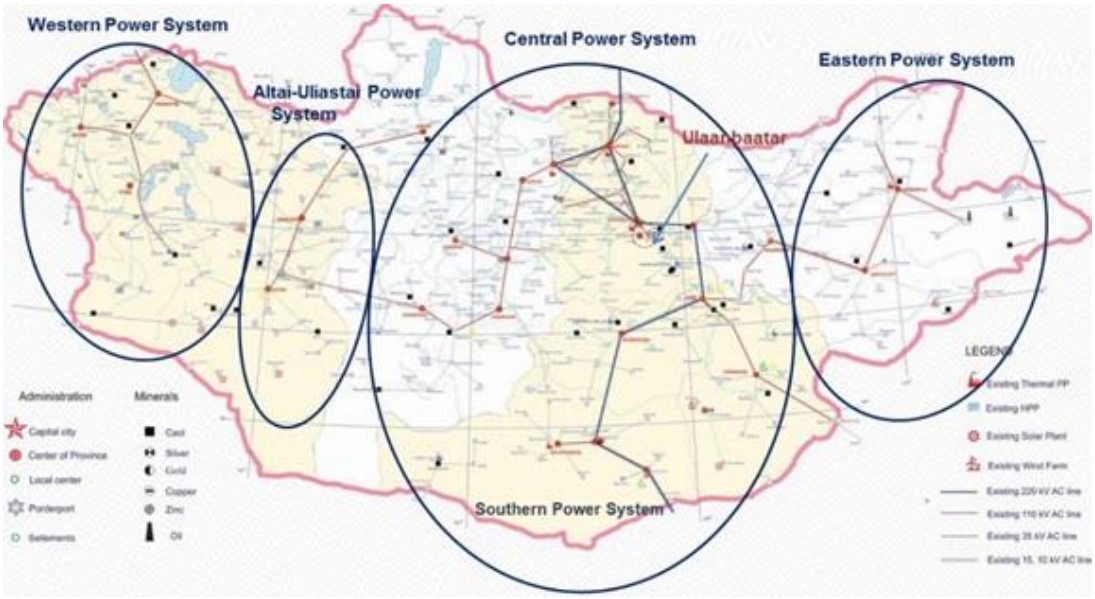

Figure 19. Mongolian power grid 5 systems

Source: Purevjav, 2020.

The five mainly independent systems are the following:

1. The Central Energy System (CES)
2. The Western Energy System (WES)
3. The Altai-Uliastai Energy System (AUES)
4. The Eastern Energy System (EES)
5. The Southern Energy System (SES)

The CES supplies electricity to consumers in the central part of Mongolia, which covers more than 70 % of the territory and 80 % of the population of the country. The CES includes 6 coal-fired CHPs, 3 Wind power plants (PPs), and 5 Solar PP, and is connected to the Russian power grid by a double circuit 220 kV OHL (overhead line) to allow imports of electricity. The CES is also connected to the EES and AUES by 110 kV OHL, over which power is transferred to the CES from the other two systems.

The WES imports electricity from Russia via a 220 kV OHL. The Durgun Hydro Power plant, with a capacity of 12 MW, operates in parallel with the import line in this system and supplies electricity to the consumers in the three western provinces.

Operation of the AUES is based on the Taishir HPP with a capacity of 11 MW and diesel generators and imports of electricity from the CES in some areas. The AUES supplies power to consumers in the Govi-Altai and Zavkhan provinces. The EES operates based on a CHP plant with a capacity of 36 MW to supply electricity to consumers in Dornod and Sukhbaatar provinces and the Sukhbaatar branch of the EES is connected to the CES by a 110 kV OHL. The SES is connected to the CES by 110 kV and 220kV OHLs, and the Dalanzadgad CHP with a capacity of 9 MW is operated in parallel with these imports from the CES to provide electricity supplies for the SES.

The main load centre in Mongolia is the central zone, which includes the City of Ulaanbaatar. The main transmission lines in the CES are 220 kV and span a total of 1,412 km between the Russian border and the following substations: Darkhan, Erdenet, Songino, CHP4 (in Ulaanbaatar), Ulaanbaatar, Baganuur, Choir, Mandalgovi, Tavantolgoi, and Oyutolgoi. The maximum voltage level of the existing system under current operation is 220 kV (Purevjav, 2020).

Solar and wind are abundant energy sources with the highest potential in Mongolia (see section on RE potential below). But the National Dispatching Center (NDC), the national power system operator and the owner of the existing electricity management system find it challenging to maintain the stability of the power grid with increasing output from fluctuating and intermittent renewable energy sources, such as solar photovoltaic and wind turbines, in the grid. These constraints make it difficult for Mongolia to achieve the national renewable energy share target. In case of significant power supply and demand imbalance, the power grid could suffer from large-scale blackout. Therefore, there is an urgent need to establish a smart integrated monitoring, and control energy system by adopting innovative technologies and solutions.

Heat Sector

The country uses more than 90 % of generated energy for heating purposes only, and approximately **57 % of the total heat generated is used for space heating and water heating in residential buildings only**. According to the Statistic book 2021 of ERC, 89, 8 % of the total national **electricity** production (7,913,6 million kWh in 2021 (ERC, 2023)) was generated by 8 coal fired CHP's which are at the same time major heat energy suppliers (81.8 %) in the country (total heat energy production amounts to 11,092.2 thousand Gcal in 2021). Beside these CHPs there are a lot of small coal fired HOB (heat only boilers) in province centres and villages producing and suppling heat energy only (ERC, 2023).

Table 14. Heat energy consumers (ERC,2023).

	Location	Number of consumers	Share [%]
1	Capital City Ulaanbaatar	302,951	73.3 %
2	Other cities (Darkhan, Erdenet, Dornod, Dlanzadgad)	42,768	10.3%
3	Provinces	67,640	16.4%
TOTAL		413,359	100%

It is to be stated that in terms of strategies or plans that deal with a diversification of the current energy system relevant for a coal phase-out transition, no policies exist that comprehensively describe or plan for such diversification. Nevertheless, Mongolia has great potential for energy production from RE, which is described in the following sections.

RE potential in Mongolia: wind and solar PV

According to the ADB sources the country's combined wind and solar power potential is estimated to be equivalent to 2,600 gigawatts (GW) of installed capacity or 5,457 TWh of clean electricity generation per year (ADB, 2024). The amount is enough to meet the country's power demand (ca. 6,8 TWh) and can meet northeast Asia's regional energy demand with a suitable transmission infrastructure. The government's target is a share of renewable energy in total installed capacity of 20 % by 2023 and 30 % by 2030 as announced in the State Policy on Energy, 2015–2030 (IEA, 2018).

"The country's rich renewable energy resources have not been fully utilized yet for various reasons," says Director of ADB's Sustainable Infrastructure Division in the East Asia Department Sujata Gupta. "One of the challenges is the variability of renewable energy generation and the lack of regulation reserve—or flexible generation. Because the renewable energy output fluctuates subject to weather, the regulation reserve—usually contributed by the other power plants—needs to constantly fill the gap between the renewable energy outputs and demand."

Further, even if a sufficient amount of regulation reserve is available, the country's energy market lacks the system to provide regulation or ancillary service in an efficient manner. For those reasons, renewable energy plants' output is curtailed during off-peak hours. This has made the country's renewable energy investment less attractive for the private sector.

Hydro Power Energy Potential

With it's around 3,800 small rivers, Mongolia has a significant potential for hydro power generation of around 6.2 GW. Around 13 small to medium sized hydropower plants with capacities ranging from 0.15 to 12 MW exist in the western and northern areas of Mongolia. The electricity generated by these hydro power plants is mostly supplied to local rural areas within isolated grids. The planned hydro power plants along Selenge River and Hovd River would increase the Mongolian electricity production by hydro power significantly. Since the plants along Selenge River would be installed in the area of CES, they could supply UB City with electricity easily. However, their location close to Russia and the associated impacts on the Lake Baikal lead to resistance of Russia to the realization of these projects. Despite the fact of the significant potential in Mongolia, in this study hydro power is not considered as an energy source, since there is no significant hydro power potential within and close by UB City and there are uncertainties on the possibilities to make use of the potential at Selenge River due to the resistance of Russia to the installation. In addition, freezing (typically from October to April) and probably climate change effects are limiting the availability of hydro power during the year.

Geothermal Energy Potential

Considering the large number of hot springs located in Mongolia, a high potential of geothermal energy could be expected. However, no systematic studies on the geothermal potential are available regarding the feasibility to contribute to district heating in UB City. Some studies have identified hot springs with an available thermal output between 1 to 15 MW, but these sources remain limited and very local.

Due to the lack of information on its potential, geothermal energy is not considered as an energy source in the target energy system of UB City in 2050 yet. However, it is assumed that there is a reasonable potential available to make use of some of the geothermal technologies: shallow geothermal collectors and boreholes up to 400 m depth, which typically provide a primary source for heat pumps, deep geothermal boreholes of 1000 m depth or more, which could provide hot water for district heating, this means with a temperature of at least 60°C. Also the use of the underground as heat storage with geothermal technologies is from growing interest in other countries and should be evaluated. If a significant geothermal potential at reasonable costs is available, it would be very helpful to provide heat during winter time. Therefore, it is highly recommended to explore and evaluate the geothermal potential in UB City and the region around UB city in detail and take the expected technological development in efficiency and costs in the coming years into account.

It can be summarized, that Mongolia has not only huge resources of coal, but also an abundant potential for renewable energies, especially for solar and wind, which points out the opportunity to substitute coal as a heavy CO_2 emitter and air polluter to a large extent by climate friendly renewable energy sources.

Regional Level

There is a coal-fired thermal Plant in Nalaikh district that was founded in 1976 and has been in operation since 1995. The total capacity is 69 MW. But as of information provided by Mr. Enkhtuvshin, director the the Nalaikh Thermal plant, the actual capacity is only 39 MW due to lower efficiency rate of outdated boilers. As of 2023 more than 3,200 households and over 300 institutions and enterprises are provided with heat and hot water. Furthermore, the current capacity overload is at 7.6 %, indicating that more consumers are connected to the grid than intended.For 2025 this over load is expected to reach 18% he said. The operation section of Nalaikh Thermal Plant operates 24 hours continuously in 4 shifts, according to the schedule approved by the Ministry of Energy, the firing of the furnace is coordinated with the outside air temperature.

In Nalaikh, there is no plan for phasing out of coal in the energy sector to renewable energy but a new coal based Thermal Plant is planned and for which the feasibility study has already been done and the approval is pending. The total capacity for the planned Thermal plant will be 216 MW consisting of three furnaces with each 58 MW capacity and 2 furnaces with 21 MW. This is included in the Action plan of Nalaikh in Vision 2050.

Energy demand projections (for Capital City Ulaanbaatar)

There are no projections available for the whole country, but for the capital city Ulaanbaatar a pre-feasibility study has been implemented by Fraunhofer ISE in 2018.

Table 15. Projected electricity demand in Ulaanbaatar City for 2050 (Fraunhofer ISE, 2018)

	Electricity demand 2016 [GWh/a]	Electricity demand projection 2050 [GWh/a]	Change
Residential sector	782	1,564	+100 %
Entities and industry	1,183	1,618	+37 %
TOTAL	1,965	3,182	+62 %

The projection in table 6 shows that demand for electricity will increase significantly in the medium-term future with a total increase of 62 %, necessitating a significant expansion of RE capacity and electricity grids.

Table 16. Development of the heat demand in UB City from 2015 to 2050 (Fraunhofer ISE, 2018).

Indicator	2015	2050	Change
Heat demand residential sector [GWh/a]	7,652	10,414	+36%
Heat demand entities and industry [GWh/a]	2,494	3,410	+37%
Total heat demand [GWh/a]	10,146	13,824	+36

As the table above shows, the total heat demand of UB City is projected to rise by 36 % until 2050. Since it can be assumed that in a future with reduced greenhouse gas emissions, more electricity will also be used to generate heat, this is another development that calls for RE expansion. The recommendation for the energy system of UB City below underpins that statement with a recommended share of 85 % of heat generated by electricity. The recommendation below was taken from the study 'Energy master plan for Ulaanbaatar" (a pre-feasibility study) conducted by Fraunhofer ISE in 2018. It recommended following target system in 2050:

- 6,409 MW photovoltaic power plants (providing 38 % of electricity demand)
- 3,794 MW wind power plants (37 %)
- 573 MWel coal-fired and a 53 MWel waste incineration CHP plant (22 %)
- 3 % of the electricity demand is imported.
- 15 % of the heat demand is delivered by the CHP plants.
- 85 % of the heat demand is generated by electricity via heat pumps and direct electric heaters.

A systematic long-term transformation is necessary to achieve the target energy system. A possible transformation path is described in the study.

RE potential in Capital City Ulaanbaatar

Since no data on renewable energy potentials are available specifically for the district of Nalaikh, but Nalaikh is one of nine districts of the Mongolian capital, the potentials of Ulaanbaatar City are presented below. The roof-mounted PV potential in 2050 will be higher due to the increasing rooftop area in the future. It is assumed that the rooftop area of around 35.7 km² in 2015 will

double between 2015 and 2050. This assumption is based on considerations regarding the growth of the population of UB City, the erection of new buildings and the expected change in the building structure. Moreover, it is projected that a share of 40 % will be usable for the installation of PV modules due to a PV supporting built-up of newly erected buildings. Accompanied by an expected increase in the yield of PV modules (the PV module efficiency is expected to increase from almost 20 % today to 25 % in 2050), the total potential for roof-mounted PV in 2050 results in a capacity of 7,141 MW.

Potential of Ground-Mounted PV Systems

Besides the possibility to install roof-mounted PV, the huge land area of UB City without settlements offers the possibility to erect ground-mounted PV systems as well. However, since shadowing of modules, nature conservation, streets, accessibility, ownership issues and other reasons limit the suitable land area, only 1 % of the south oriented non-settlement area of UB city was considered for ground-mounted PV. By using GIS data, the south-oriented area was calculated to 668 km² (see Fig. 36). 1 % of this area (6.69 km²) results in a potential of ground-mounted PV capacity of around 1,340 MW today. Taken future efficiency improvements into account, a ground mounted PV potential of 1,500 MW is projected for 2050.

Wind Energy Potential

Since no detailed information has been available on the available land area to install wind power plants in the area of UB City, it is conservatively assumed, that 1 % of the total land area of UB City (without exclaves) can be used for the installation of wind power plants. Landownership, nature conservation, in appropriate topology, streets and railroads, minimum distance to settlements and other factors reduce the size of the suitable land for wind power plant installations. However, it should be no problem in UB City to use at least 1 % of the total land area. The resulting suitable area of around 39.5 km² has been used to calculate the capacity of wind power plants and the possible wind yield. By assuming wind power plants similar to Enercon's E-141 with a hub height of 159 m, a potential of 600 MW installed wind capacity has been derived within UB City in 2050.

Considering which renewable energy technologies have the greatest potential to adapt to existing infrastructure it can be stated that the area hosting the thermal power plant of Nalaikh has the potential to become a renewable energy generation site. Two specific spots within the district offer potential: the first is the Industrial Park, currently grappling with power shortages and could gain from investment in renewable energy. Secondly, there is an ongoing installation of a solar panel system named Ochir Dagenes that has a 16MW capacity. However, it cannot be officially connected to the grid presently due to registration issues with the state.

In terms of available and needed financing for activities of a possible JET process in the energy sector, it can be said that the funding of coal-fired power stations is looking increasingly doubtful, as donors from around the world, including China, have officially agreed not to provide financial

support for foreign coal-fired power stations at the COP (Conference of the Parties). As a result of reaching their maximum debt level, the Mongolian Government is prohibited from acquiring additional loans. The energy sector heavily depends on baseload coal, hindering its ability to adapt to fluctuating renewable energy sources, and the transmission grid capacity remains inadequate. Several organizations, such as the World Bank, European Bank for Reconstruction and Development, Asian Development Bank, European Union, KfW (German state-owned investment and development bank), and more, have indicated their enthusiasm for financing sustainable energy solutions. Nevertheless, Mongolia needs to provide co-financing, which is a big problem for the country. The Green Climate Fund (GCF) has financed two projects (MGFC and UNDP), both waiting on Mongolia's contribution. GIZ is preparing a new project on Capacity Development for Sustainable Energy, scheduled to commence in early 2024 with a budget of 2 million euro. The objective is to tackle capacity issues in energy institutions by delivering training updates for high voltage technicians and encouraging the uptake of renewable energy technologies.

In the 2023 State budget proposal, Mongolia aims to intensify its endeavours in enlarging the energy sector. Thirteen projects will be executed under this framework, and discussions regarding six new projects are currently ongoing. A full project list is provided in the annex 2.

JET related SWOT (energy)

Table 17. JET related SWOT (energy)

Strengths:	**Weaknesses:**
National: Ambitious target for CO_2 reduction in updated NDC. Mongolia has superabundant RE sources: combined wind and solar power potential is estimated to be equivalent to 2,600 gigawatts (GW) of installed capacity or 5,457 terawatt-hours of electricity generation per year. Influential MP from Nalaikh district (Deputy prime minister) can push JET related activities. **Regional:** Strong commitment of the Governor of Nalaikh for pioneering of new (Jet related) approaches.	**National:** Lack of JET strategy in the national long and mid-term development policies. High dependency of the energy sector on coal (over 90 %). High dependency of national budget from coal export revenues. Despite its sufficient coal and oil reserves, Mongolia is 100 % depended on imports of petrol products (no domestic refinery resources) and 19 % on electricity imports from Russia. Weak liberalization of the energy sector, low tariffs. Business environment for RE is not good (limited regulating capacities of the energy system and outdated inefficient transmission lines). Insufficient security for RE investments.

Illegal mining closed completely in Nalaikh region.	Weak political dialog and coordination among international donors and partners (national ministries are not involved). Lack of public awareness for JET strategies. Heat: 90 % of generated energy is used for heating purposes only; 57 % of the total heat generated is used for space heating and water heating in residential buildings. Heating of buildings consumes by far the most energy and causes severe air pollution, in Ulaanbaatar city. **Regional:** Lack of people with English knowledge in Nalaikh for JET project exchange.
Opportunities:	**Threats:**
National: Non-availability of financing resources for any coal projects on international finance market. Expansion of existing coal CHP plants near to limits Reduction of Chinese coal imports in near future expected. Development of RE technologies, competitive RE production unit costs. Road map for the green sustainable financing mechanism approved by the banking sector Mongolia. Mining area needs to be regenerated and reused. **Regional:** Pressing problems regarding the air pollution in Nalaikh district, ban on raw coal usage in Nalaikh adopted. Power to heat solutions and RE sources for Thermal plant in Nalaikh.	**National:** Political instability due to recent coal theft cases. Economic development perspective, crises (high debt service in coming years, high inflation, unemployment, long recovery from pandemic impacts). Lack of incentives for green and energy efficient measures. Lack of strong commitment to CO2 reduction. Mongolia is currently not creditworthy on internarial arena. No visible long-term solution exists for the substitution of coal for heating energy generation. **Regional:**

Main driver: High dependency of the energy sector on coal and lack of JET strategy.

Main barrier: Very high potential for the massive expansion of renewable energies.

9. Results from the analysis and recommendations for the JET process

In order to prepare the ground for developing fact-based ideas for the support of a coal phase- out and a JET process in Mongolia, key areas were analysed. In the following, the major results as well as the conclusions and recommendations deducted from the analysis are presented.

9.1 On the national level of Mongolia

Governance

Although Mongolia has raised its Nationally Determined Contributions (NDC) commitments between 2016 and 2020 to a 22.7 % reduction of GHG emissions by 2030, it has neither committed to a coal phase-out on an international nor on the national level, neither for energy production nor for mining and exporting coal. The Government intended an expansion of coal-based heat and power plants of up to 981 MW, but only an expansion of 15 MW wind and 35 MW solar power plants (Action Plan 2020-2024). This is counterproductive to climate mitigation objectives and a JET process. At the same time, the government is lacking funding for new coal-based capacities, so it is not expected that new coal-fired capacities will be installed within the next 4/5 years. The massive expansion of coal-based heat and power plants would also contradict the action plan for reducing Ulaanbaatar air pollution by up to 80 %. While the potential for renewable energies is immense in the country, the limit for variable grid-connected renewable energy to be installed in Mongolia is the existing grid and a conflict about the feed-in conditions for renewable energies. A strength is the country's CO2 reduction targets as laid down in the NDCs. In its NDCs, Mongolia has raised the RE target for 2030 to 30 % and commits itself to improve the efficiency of energy production.

Corruption has become the major obstacle to prosperity in the country. While significant legal and institutional frameworks, such as the Anti-Corruption Law (ACL) and the Independent Agency against Corruption, were put in place in the last decade, the implementation of anti-corruption policy has been plagued by deep-seated conflicts of interest in politics.

Conclusions and recommendations:

Support a revision of the energy plans towards an alternative energy scenario, allowing to superseding of additional coal-based plants and a massive increase in RE.

Need to create awareness for the possibilities from a coal phase-out planning and energy transition on the political agenda, legitimised by NDC and net zero CO_2 commitment.

Raise awareness on the real costs for existing and additional coal plants, the possibilities and benefits of RE expansion as well as energy saving and efficiency increase measures (e.g. for residential buildings, mining sector).

Current governmental action plans on the national and district levels are valid until the election in 2024. Use a window of opportunity to include political initiatives on Just Energy Transition when establishing new plans. Develop ideas on how to involve key actors from democratic institutions and civil society in that process.

Need to step up efforts to combat corruption like a stronger enforcement of the ACL in order to make Mongolia more trustworthy for private and public investment.

Coal and energy sector / climate

The extremely high air pollution levels in Ulaanbaatar and other towns are mainly caused by coal use. In order to combat air pollution as well as CO2 emissions, coal phase-out and energy transition are indispensable. With regard to climate change, Mongolia aims to achieve the target of reducing its greenhouse gas emissions by 22.7 % (unconditional target) by 2030 in its 2020 NDCs. Yet, Mongolia's activities for climate protection stand in sharp contrast to many of the short-term activities planned in the Action plan of the Government of Mongolia for 2020-2024, which includes massive expansions of coal-based heat and power plants (CHP) and there is no net-zero long-term strategy yet.

Mongolia has superabundant RE sources for the production of renewable electricity: combined wind and solar power potential is estimated at 2,600 GW of installed capacity or 5,457 TWh of electricity generation per year. This exceeds the country's power demand (ca. 6.8 TWh) by far. However, the heating required during 8.5 months of the year - that is provided by the district heating grids of coal-fired combined heat and power plants - is crucial in the coldest capital of the world. Mongolia has vast coal resources, the country ranks 17th in the world in terms of coal production and before the outbreak of the coronavirus pandemic in 2019, a record-high of 57.128.600 tons of coal were mined in Mongolia. Consequently, the energy system of Mongolia is mainly based on coal. 82 % of the installed power generation capacity is coal based; 17,5 % on RE. Exploiting Mongolia's enormous RE potential could simultaneously mean switching the energy system from fossil to renewable sources and transforming the country from a coal exporter to a RE exporter, which could reduce economic dependence on China. However, the business environment for RE is not suitable yet for mobilising the vast RE potential due to the descendants of a socialist-designed energy market and the insecurity of RE investments, in part due to

widespread corruption. In addition, the power grid cannot be run in a stable way when more and more fluctuating RE power will be fed in.

Conclusions and recommendations:

Need for mobilising RE potentials through the implementation of reliable energy market design and regulations to allow private investments to be attractive, for example through taxes, new feed-in tariffs or energy auctions, loans, or the implementation of existing energy efficiency standards.

Need for modernisation of the power grid in order to take up fluctuating RE and even export energy in the long-term.

Need for developing climate-friendly heating opportunities for residential buildings and the construction of energy-efficient buildings, in particular for ger areas.

Need for exploring and developing potentials for energy efficiency increases on the supply and demand side.

Need for a stronger awareness of the negative impacts of climate change for Mongolia caused by the continued massive use of fossil fuels for energy and heat generation.

Need for the introductions of stricter policies for land restoration and biodiversity protection on the national level to support the ecological regeneration of mining sites and mining areas post closure.

Raise awareness and foster political dialogue on the potentials and benefits of RE.

Support influential actors and activities for the energy transition, addressing the needs mentioned above.

Take measures to attract more domestic and foreign companies to the RE sector, e.g. special support programs for companies that promote the expansion of RE.

Society

Coal mining as well as heat and electricity generated by coal seem to be deeply rooted in the present narrative of successful development and prosperity in Mongolia. Even high risks of an economic downturn due to the dependency on a coal-based development model in a global political situation aiming at phasing out coal, in the long run, are accepted. Key actors and stakeholders know the harm of it but hardly take any action or see any plans for phasing out coal

in the short term. However, they have a basic awareness that in the mid- and long-term they must take steps for phasing out due to the heavy climate change impacts in Mongolia and potentially due to increasing international political pressure and restricted access to finance. In this regard, the democratic political system and the vibrant civil society are an asset.

The stakeholder analysis revealed that for now, Mongolia has no real driving force on the national level when it comes to JET. However, financial institutions, including private banks and development banks, seem to be the most active actors in fostering green investments in the country, but without a specific focus on JET. Academic actors, international organisations, and renewable energy associations support the JET targets in principle, but not yet proactively.

Attitudes and activities hampering a JET process are to be stated in regard to thermal power plants, mining companies, mining-related public actors (e.g. the Ministry of Mines and Heavy Industry), some business associations, coal mining companies' associations, and trade unions.

Conclusions and recommendations:

Need to raise awareness of the negative impacts of coal mining and energy generation as well as showcase alternatives and develop pilot actions.

Mongolian society needs to be made more aware of the fact that the great RE potential is an alternative source for both heating and economic development.

Need to transform the basic awareness of key actors and stakeholders of the necessity for a coal phase-out in the long-run into the will to act accordingly.

Need to raise awareness of tackling economic risks by developing transformative development paths, focusing on the potentials for green growth in the sectors of energy, construction of residential buildings, restoration of mining areas, etc.

Raise awareness that phasing out coal sooner will improve access to international finance for climate mitigation and energy transition; showcases from other countries in the JET project like South Africa, Indonesia, and Viet Nam.

Economy

Coal mining and energy generation are the backbone of Mongolia’s economy. Since 2015 Mongolia has rather engaged in expanding the mining, use, and export of coal than in a phase- out. This development has only been interrupted by the coronavirus pandemic in recent years. The coal industry produces about 40 million tons of coal on average per year, estimated coal reserves are

37.2 billion tons. Mongolia has substantial high-quality coking coal reserves and is on track to become one of the world's largest coal exporters. As Mongolia has the fourth largest coal reserves in the world, this trend is extremely critical in regard to climate mitigation. In 2021, 50 % of produced coal was exported, of which 93 % was going to China. Coal exports account for ca. 26,5 % of total exports of Mongolia, which, combined with the fact that many other Mongolian products are also mainly exported to China (ca. 73 % of exports go to China), makes Mongolia extremely dependent on China economically.

The growth of labour demand is not strong enough to reduce unemployment. Mongolia has relatively high unemployment rates, especially for young people. The economy has the potential for diversifying its production, notably agri-food (livestock, dairy products, meat, cashmere) and tourism. Further, Mongolia possesses abundant mineral resources, including strategic raw materials for information & technology industries, as well as vast RE potentials, which can be utilised for economic diversification and for export.

Conclusions and recommendations:

Need for exploring economically viable options for a further expansion of RE including the possibilities for international finance and technical assistance and reducing fossil- based imports.

Need for developing mining and related value chains apart from coal in a sustainable way.

Need for developing opportunities for a climate resilient and GHG emission-reducing agriculture and food sector, including tourism.

Need for the diversification of the export structure in order to reduce economic dependency on China.

Need to explore the qualification demand of the workforce and the introduction of training schemes in regard to sectors for green transformation (named above).

Gender

In Mongolia, boys are often left behind in education as they are deemed to be better suited for herding, yet there are still more men than women occupying high-level positions, for instance in the Energy sector. Women are predominantly found in retail sectors, and motherhood creates a disadvantage for them to pursue senior positions in their careers. Although country- specific data for the mining sector is not available, it is quite likely that women in Mongolia also suffer from mine closing. Experience from various countries on the impacts of coal phase- out on women proves that women are generally affected negatively in two ways: Firstly, the households of mine

workers lose their jobs and their income due to the shut-down of coal mines. As miners are dominantly male, women often suffer as dependent spouses of laid-off miners. Secondly, people working in the informal sector around the mines to supply the miners with food and other services lose their jobs without any compensation. It is mostly women performing such informal jobs. In the energy sector, most high-level and decision- making positions are male. Despite a legal requirement for a quota of 30 % of women in leading positions in the Ministry of Energy, the present quota is only 15 %.

Conclusions and recommendations:

Although the regulative requirements have improved, there is a lack of law enforcement as well as an understanding of gender equality at all levels, inter-sectoral coordination on gender issues, and the full use of donor research and financial support. The Government should raise its efforts in order to progress.

Need to raise public awareness on gender policies and issues. In addition to written policies, practical support and implementation are necessary for women's employment. This involves creating opportunities for women to take on high level positions, for instance.

Need to collect and analyze more disaggregated socio-economic data (by gender and other indicators), in order to obtain a solid and convincing knowledge base, from which recommendations for action can be derived.

In regard to coal phase-out and JET, opportunities should be created that allow women to pursue more chances in their career development.

9.2 On the regional level of the Nalaikh region

Governance

The key institutions on the regional level in the Nalaikh region are the Nalaikh Governor's Office and Citizen's Council and the Parliament of Nalaikh district. Although there is no dedicated strategy for a coal phase-out and a JET process available for the region, the 'Action program of the district Governor for 2020-2024' as one of the key governance instruments for regional development is adressing actions relevant to a JET process indirectly. It aims to enhance adequate employment opportunities by facilitating citizen's access to permanent and temporary jobs in national and regional large-scale projects concerning mining and construction. These projects include the railway, construction materials, an industrial technology park, an improved fuel factory, and opportunities for decent labour to decrease the unemployment rate. It also requires the development, approval,

and implementation of measures targeted toward household manufacturers, small and medium-sized enterprises, and private entities that are tailored to the district's specificconditions.

There are no active communities or civil rights movement groups to bring their voices and demands in the district except the Nalaikh Mining NGO which has been inactive since the mining closed.

Conclusions and recommendations:

Need to align the key regional development programmes and plans like the 'Action program of the district Governor for 2020-2024' to transformative areas such as RE increase, restoration and reforestation of mining areas, agriculture, tourism, etc.

Need to develop a concrete plan and activities for the reforestation of the closed mining area.

Need to stimulate civil society participation in order to better identify needs and ideas for JET-related development of the region.

Raise awareness on the benefits of establishing the Nalaikh region as Mongolia's first and blueprint JET region, based on a comprehensive notion for phasing out coal for all energy purposes and going green.

Concretise ideas to foster civil society participation for a JET-related development of the Nalaikh region, for example by addressing the well-organised community of former miner workers.

Coal and energy/climate

In 1992, the Nalaikh coal mine was formally closed. However, artisanal or rather illegal mining with considerable safety risks and regular accidents continued until 2022, when the mine was finally closed. Since then, the closed mining area stays without any reforestation or any other reutilization which causes significant harm to the environment and people. Some money from the district budget flows into regeneration activities annually, though these activities are unstructured and do not follow a comprehensive regeneration plan.

Despite having the coal mine closure, Nalaikh is still dependent on coal (imports) in the areas of electricity and heat production. Nalaikh's coal-based heat plant is operating at its limits. It is supplying more than 3,200 households and over 300 institutions and enterprises with heat and hot water. A new coal- based thermal plant with a capacity of 216 MW (three times as much as the existing one) is planned for which the feasibility study has already been done but approval is

pending. This is included in the Action plan of Nalaikh in Vision 2050. There is no plan for phasing out coal in the energy sector and to switch to renewable energy. The existing small RE park (wind and solar) is not functioning and is not connected to the grid.

Conclusions and recommendations

Need to bring RE-based opportunities into the discussion; for heating as well as for power generation, including possibilities for getting the existing RE park operational.

Support the development of a regional JET strategy for Nalaikh as well as concrete steps to substitute additional demand for heat and power by RE.

Adopt a plan for the ecological regeneration of the former mining site, which could be part of the JET strategy.

Economy and Society

Nalaikh district is the first to undergo a significant transformation away from coal mining, following the closure of its mine. The economic prospects and requirements for diversi- fication in Nalaikh are different from other Mongolian districts due to the closed mining site, as well as the proximity to the city and national park, which is a popular tourist destination. The national economic plans and political strategies are all merging into a scenario of in- creasing coal exploration and exports (mainly to China) for the next 10 years whereas Nalaikh already officially phased out coal mining in 1992 (phase 1) and banned informal coal mining in 2022 (phase 2). The phase-out in 2022 had a relatively low economic impact. However, it destroyed the income source for the former mining families, declining more than 2000 fami- lies in the period from 1992 until 2010 to around 500 families in 2022.

Migration itself and unregistered migrants have become pressing issues for the district. 36 % of Nalaikh's population live below the poverty line and it is estimated that 32 % of the adult population is unemployed.The economy is still dependent on coal in the areas of electricity production, and centralised and decentralised heat production. Nalaikh has a high rate of unemployment. The current social protection programmes in Nalaikh do not specifically target former miners. Strengths are the technical and vocational education facilities of the German-Mongolian Institute of Technology (GMIT), opportunities for economic diversification due to its proximity to the capital city and tourist destination, and the request of Nalaikh's recovery plan until 2030 for regeneration of the former mining area. In terms of ecological regeneration and future opportunities for the former mining area, every year some money from the district budget goes into regeneration activities. The process and the activities are not fully structured. Nevertheless, based on the Vision 2050 and the new recovery plan until 2030 the district of

Nalaikh has defined a future economic growth plan, with five main areas: Tourism (renaturation & museum), logistics, agriculture, SME development and an industry park.

Conclusions and recommendations:

Need for an in-depth analysis of specific regional potentials for transformative economic development, aligned to JET goals and dimensions. One focus should be on activities in the current action plan such as tourism, construction materials, residential buildings, and industrial parks.

Need for alignment of regional strategies, programmes, and plans to JET goals.

Need for qualifying the workforce and introducing training schemes as required by a future regional JET strategy, paying attention to GMIT and other available resources.

References

Allyson Seaborn, Coal Mining in Nalaikh Mongolia
https://www.youtube.com/watch?V=stts88tnaku

Asian Development Bank. (2021, June). Climate Risk Country Profile: Mongolia.
Https://www.adb.org/publications/climate-risk-country-profile-mongolia

Nyamaa/Blume (2023). Stakeholder Analysis for Mongolia with local focus on Nalaikh.

ECONOMIC POLICY AND COMPETITIVENESS RESEARCH CENTER

Fernanda de Carvalho, Global Policy Manager
https://wwfint.awsassets.panda.org/downloads/ndcs_we_want_checklist___mongolia.pdf

GENDER MAINSTREAMING IN GREEN DEVELOPMENT POLICY OF MONGOLIA, 5 DECEMBER 2016

Global Methane Initiative Country profile
https://www.globalmethane.org/documents/Mongolia%20Country%20Update.pdf update 2022: https://www.globalmethane.org/documents/toolsres_coal_overview_ch22.pdf

International Energy Agency (2018), Mongolia State Policy on Energy 2015-2030,
https://www.iea.org/policies/6470-mongolia-state-policy-on-energy-2015-2030

Joseph Campbell, Coal mine crackdown dims prospects for Mongolia's fortune seekers
https://www.reuters.com/article/us-mongolia-coal-iduskbn19y00f

Law of Labor Mongolia, 1999

LAW ON LABOR OF MONGOLIA (legalinfo.mn)

Mineral resources and petroleum authority Mongolia https://www.mrpam.gov.mn/news/1801/

Mining Journal Mongolia, How to remember the glory days of Nalaikh, 2018-12-18
Https://www.mongolianminingjournal.com/a/66226?Locale=en

Ministry of Mineral Resources and Energy. (2015). State Policy on Energy 2015-2030.
Https://energy.gov.mn/laws/show/id/202

Mongolian mining poised for big changes as it enters its second century 2022-03-02
Https://www.mongolianminingjournal.com/a/72079?Locale=en

Our World in Data. (n.d.). Greenhouse gas emissions by sector, Mongolia, 2019.
Https://ourworldindata.org/grapher/ghg-emissions-by-sector?Time=latest&country=~MNG

Our World in Data. (n.d.). Mongolia: Has economic growth decoupled from CO2 emissions Https://ourworldindata.org/co2/country/mongolia#has-economic-growth-decoupled-from-co2-emissions

Pearly Jacob Apr 27, 2011 Mongolia: Death Stalks Country's Oldest Mine Https://eurasianet.org/mongolia-death-stalks-countrys-oldest-mine

Prefeasibility Study of Naliakh Mine: Opportunities and Challenges M. Badarch, Dr Director of Mongolian Nature and Environment Consortium B. Namkhainyam, Mongolian University of Science and Technology G.Tulga, Ph.D Manager of MCS International Co.,ltd 2010

State Policy on Energy for 2015-2030

Statistics on energy performance 2021, Energy Regulatory Commission 2021 Erc_statistics_2021_eng (fliphtml5.com)

Study on Employment of Mining in Mongolia, 2018 Hyyp (mrpam.gov.mn)

Tovuudorj Purevjav, "MONGOLIAN GRID DATA ", napsnet Special Reports, September 20, 2020, https://nautilus.org/napsnet/napsnet-special-reports/mongolian-grid-data/

Udriin sonin" Newspaper, Nov30, 2022 release

Unlocking Mongolia's Rich Renewable Energy Potential 2020, ADB https://www.adb.org/news/features/unlocking-mongolias-rich-renewable-energy-potential

WWF International. (2020). NDC Checklist: Mongolia Analysis. Https://wwfint.awsassets.panda.org/downloads/ndcs_we_want_checklist___mongolia.pdf

Annex

1. Detailed list of power plants and generator capacity (ERC, 2023).

Generation source	Name of generator	Heat and power or power only	Installed capacity	Year of first operation	Status and main user	Location in which of the 5 Power system
Fossil fuel (coal fired	CHP #2	Heat and power	24 MW	1961	In operation, UB city industrial and residential users	CES
	CHP #3	Heat and power	198 MW	1968	In operation, UB city industrial and residential users	CES
	CHP #4	Heat and power	772 MW	1983	In operation, UB city industrial and residential users	CES
	Darkhan CHP	Heat and power	83 MW	1965	In operation, Darkhan city industrial and residential users	CES
	Erdenet CHP	Heat and power	71 MW	1986	In operation, Erdenet city residential users	CES
	Erdenet factory	Heat and power	53 MW	1976	In operation, Erdenet Cupper Factory users	CES

Generation source	Name of generator	Heat and power or power only	Installed capacity	Year of first operation	Status and main user	Location in which of the 5 Power system
	Chopibalsan CHP	Heat and power	36 MW	1969	In operation, Choibalsan city industrial and residential users	EES (Eastern Energy System)
	Dalanzadgad CHP	Heat and power	9 MW	2011	In operation, Dalanzadgad city residential users	SES, Southern Energy System
	Ukhaahudag PP	Heat and power	18 MW	2011	In operation, Ukhaakhudag coal mining and residential area users	SES
Sum Coal			**1.264 MW**			
Wind	Salkhit WWP	Power	50 MW	2013	In operation, UB city industrial and residential users	CES
	Tsetsii WPP	Power	50 MW	2017	In operation, for users in Tsogttsetsii village, Umnugovi province	SES
	Sainshand WPP	Power	55 MW	2018	In operation, for users in Tsogttsetsii	SES

Generation source	Name of generator	Heat and power or power only	Installed capacity	Year of first operation	Status and main user	Location in which of the 5 Power system
					village, Umnugovi province	
Sum Wind			**155 MW**			
Solar	Darkhan SPP	Power	10 MW	2017	In operation, Darkhan City industrial and residential area users	CES
	Monnaran SPP	Power	10 MW	2017	In operation, Bayachandmani village, Central province, users	CES
	Gegeen SPP	Power	15 MW	2017	In operation, for users Zamiin Uud City, Dornogovi Province, (boarder City to China)	SES
Sum Solar			**60 MW**			
Hydro	Taishir HPP	Power	11 MW	2008	In operation, for users in villages of Govi-Altai and Zavkhan Provinces	AUES

Generation source	Name of generator	Heat and power or power only	Installed capacity	Year of first operation	Status and main user	Location in which of the 5 Power system
	Durgun HPP	Power	12 MW	2008	In operation, for users in villages of Uvs, Bayan-Ulgii and Khovd Provinces	WES
	Other minor hydro stations	Power	3.21 MW			
Sum Hydro			**26,21 MW**			
TOTAL			**1,482.21 MW**			

2. Projects to be implemented in the energy sector

Source: Vision 2050, a long-term policy of Mongolia.

Exchange rate: 1 EUR = 3740.0 MNT (as of Aug. 2023)

*MET-Ministry of Environment and Tourism

** ME-Ministry of Energy

Table 18. Projects to be implemented in the energy sector

№	Project name	Location	Sector	Responsible ministry, agency	Timeline	Budget [million MNT]
1	Solid waste inceneration plant	UB City	Inviromental	MET*, ME**, Administratio n of UB City	2020-2023	472,450.0
2	220 kV transmission line (Baganuur - Undurkhaan – Choibalsan), extension of 220 кV substation	Baganuur, Khentii, Dornod	energy	ME	2020-2023	302,895.0
3	Extension of Choibalsan's CHP installed capacity by 50 MW (coal fired)	Choibalsan, Dornod province	energy	ME	2020-2022	245,992.5
4	Conduct feasibility studies for small and medium size hydro-power generation capacities, identify suitable locations	Central region	energy	ME	2020-2025	133,300.0
5	Construction of 220kV power transmission line	UB City-Baganuur,	energy	ME	2020-2022	106,000.0

№	Project name	Location	Sector	Responsible ministry, agency	Timeline	Budget [million MNT]
	(Baganuur-Choir, 178 km), extension of the substation capacity	Gobisumber province				
6	Construction of “Booroljuut” CHP with 300 MW installed capacity (coal fired)	Dornogobi province	energy	ME	2020-2025	1,119,700.0
7	Construction of “Tavantolgoi” CHP with 450MW installed capacity (coal fired)	Umnugobi province, Tsogttsetsii soum	energy	ME	2020-2023	2,733,250.0
8	220 kV Power transmission line Sainshand – Zamiin Uud	Dornogobi, Gobisumber provinces	energy	ME	2020-2025	237,440.0
9	Construction of 280 MW „Shivee-Ovoo “CHP including 600 kV transmission line, extension of the coal mining deposit, conclude contract for the power export (coal fired)	Gobisumber	energy	ME	2020-2025	17,500,000.0
10	220kV power transmission line, Mandalgobi-Arvaikheer, including substation	Dundgobi province, Mandalgobi soum, Uvurkhangai province, Arvaikheer soum	energy	ME	2020-2025	155,000.0

№	Project name	Location	Sector	Responsible ministry, agency	Timeline	Budget [million MNT]
11	Project for reducing of Erdenet-Bulgan energy distribution grid losses, Baganuur south-east region	Baganuur, Erdenet, Bulgan	energy	ME	2020-2022	145,030.0
12	Construction of 315MW „Eg river“ hydropower plant	Bulgan province, Khutag-Undur soum	energy	ME	2020-2025	2,262,037.7
13	Renewal of Erdenet City Thermal plant (coal fired)	Orkhon province, Erdene City	energy	ME	2020-2021	136,389.8
14	Scaling up of RE sources in western provinces	Uvs, Chovd, Bayan-Ulgii provinces	energy	ME	2019-2023	105,280.0
15	Feasibility study for construction of 380km long 220kV Transmission line, including substation, Uliastai-Durgun-Myangad	Khovd province, Gobi-Altai soum	energy	ME	2020-2022	212,000.0
16	Construction of 64-100MW hydro-power plant in Erdeneburen soum, Khovd province,	Khovd province, Erdeneburen soum	energy	ME	2015-2022	759,332.0
17	Construction of 100MW CHP in Telmen (coal fired)	Zavkhan province, Telmen soum	energy	ME	2020-2030	491,985.0

№	Project name	Location	Sector	Responsible ministry, agency	Timeline	Budget [million MNT]
18	Construction of small scale thermal plants in 10 province centers (coal fired)	Arkhangai, Bayankhongor, Gobi-Altai, Gobi Sumber, Dundgobi, Zavkhan, Uvurkhangai, Khentii, Tuv, Sukhbaatar provinces	energy	ME	2019-2022	391,378.4
19	Construction of 118km long 220kV power transmission line to connect Baganuur substation with UB City substation, including extension of substations	UB City, Baganuur district	energy	ME	2020-2022	84,800.0
20	Baganuur 700MW CHP project (coal fired)	Baganuur district	energy	ME	2020-2041	2,623,920.0
21	Renewal and Extension of the installed capacity of CHP No.3 by 250MW	UB City, Khan-Uul district	energy	ME	2020-2023	956,637.5
22	Extension of the capacity of high-pressure division of CHP No.3 by 75 MW (coal fired)	UB City, Khan-Uul district	energy	ME	2020-2021	338,923.0
23	Renewal and extension of the Nr.1-4 turbo-generators	UB City, Bayangol district	energy	ME	2020-2025	234,921.4

№	Project name	Location	Sector	Responsible ministry, agency	Timeline	Budget [million MNT]
	capacity of the CHP No.4					
24	Construction of large-scale power storage facility for regulation purposes	Ub City	energy	ME	2020-2025	259,700.0
25	Extension of Amgalan Thermal plant by 50 MW and converting it to CHP	UB City, Bayanzurkh district	energy	ME	2020-2022	207,453.7
26	Extension of CHP No.2 capacity by 300MW (1 gas generator operates as regulating facility), gas -fired	UB City, Bayangol district	energy	ME	2020-2023	1,040,275.0
27	Solid waste inceneration plant	UB City	Inviromental	MET*, ME**, Administration of UB City	2020-2023	472,450.0

Just Energy Transition in Coal Regions