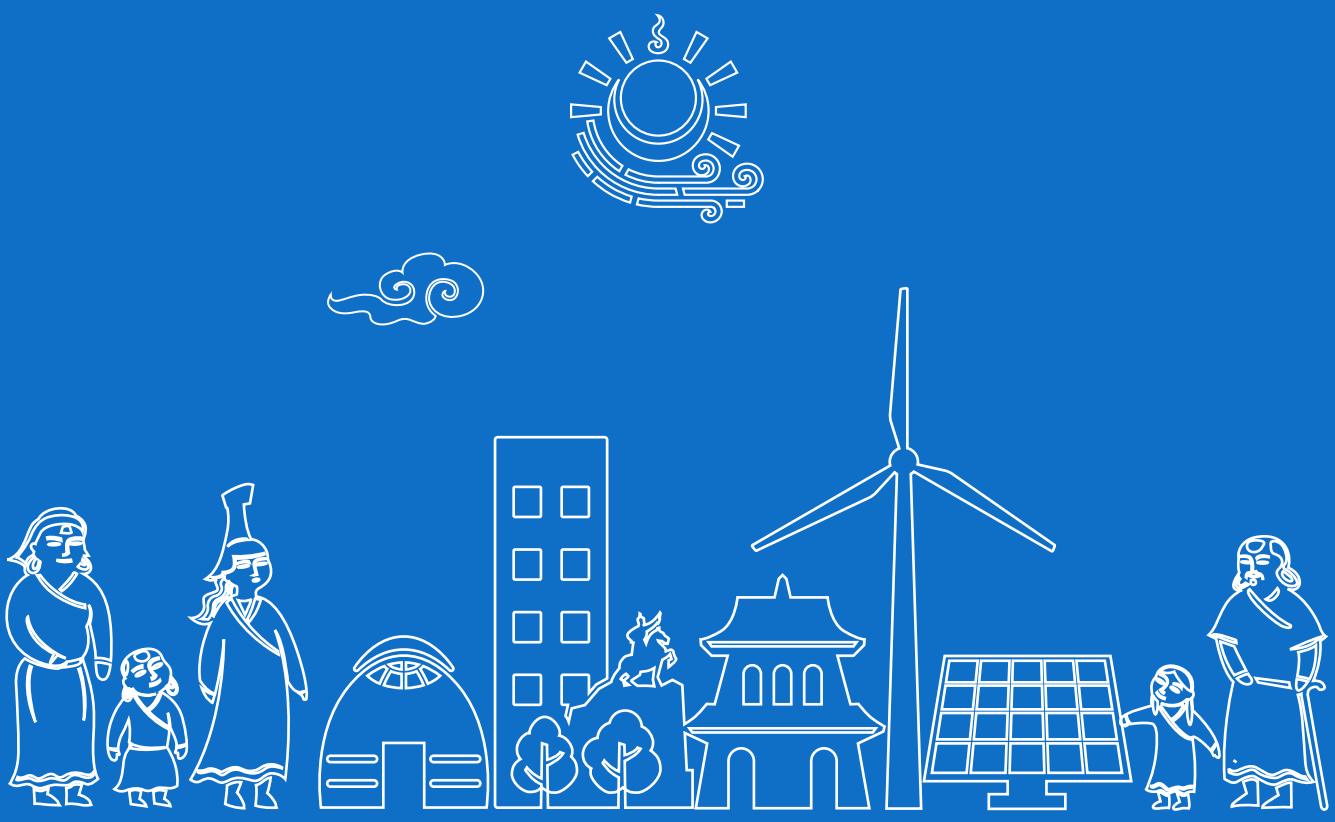
NATIONAL HUMAN DEVELOPMENT PAPER 2024

A Just Energy Transition for Human Development in Mongolia



This report does not necessarily reflect the views of the United Nations Development Programme or the Government of Mongolia.

United Nations Development Programme in Mongolia
UN House 14201, United Nations Street 14, Sukhbaatar District, Ulaanbaatar City, Mongolia
ISBN 978-9919-9177-1-5
United Nations Development Programme
email: registry.mn@undp.org
website: http://www.undp.org/mongolia

General disclaimers.

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of Mongolia Country Office (CO) of the United Nations Development Programme (UNDP) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

The findings, analysis, and recommendations of the Report, as with previous Reports, do not represent the official position of the UNDP or of any of the UN Member States that are part of its Executive Board. They are also not necessarily endorsed by those mentioned in the acknowledgments or cited.

The mention of specific companies does not imply that they are endorsed or recommended by UNDP in preference to others of a similar nature that are not mentioned.

Some of the figures included in the analytical part of the report where indicated have been estimated by the Human Development Report Office (HDRO) or other contributors to the Report and are not necessarily the official statistics of the concerned country, area or territory, which may use alternative methods. All the figures included in the Statistical Annex are from official sources. All reasonable precautions have been taken by the CO to verify the information contained in this publication. However, the published material is being distributed without warranty of any kind, either expressed or implied.

The responsibility for the interpretation and use of the material lies with the reader. In no event shall the UNDP CO, HDRO and UNDP be liable for damages arising from its use.

The contributions in boxes represent the opinions of the authors and are the product of independent research of their responsibility. They do not represent necessarily the position or opinions of the Human Development Report Office or UNDP. Any errors or omissions are the authors' responsibility. The discussion presented in the report is to stimulate debate and to encourage further dialogue between researchers and decisionmakers.

Production Team

Supervision and Guidance:	Ms. Matilda Dimovska, Resident Representative, UNDP Mongolia, Ms. Elaine Conkievich, Former Resident Representative, UNDP Mongolia
Management Oversight:	Ms. Lin Cao, Deputy Resident Representative, UNDP Mongolia
Principal Authors:	Mr. Yasin Janjua, UNDP Economist and Ms. Bushra Ferdous Khan
Research Support:	Ms. Gadha Raj Nadupparambil, Ms. Enkhbayar Dambadarjaa, Mr. Saujan Khapung, and Ms. Genevieve Connell
Editorial Support:	Mr. Peter Stalker
Digital, data and knowledge management, communications, operations:	Mr. Yanchun Zhang (HDRO, UNDP), Mr. Seockhwan Bryce Hwang (HDRO, UNDP), Mr. Carlos Escriva Gil (Former operations manager, UNDP), Mr. Mpho Motsoasele, Ms. Khulangoo Purevjav, Mr. Delgernaran Tumurtogoo, Mr. Erdenesukh Otgonbayar, Ms. Otgontsetseg Lundegjantsan, Ms. Ainur Aibyek, Mr. Ganbayar Dugar, Ms. Jingyou Zhang, Ms. Tsolmon Dayangyalbaa, Mr. Zulbayar Badral, Ms. Erguge Su, Mr. Misheel Khurelsukh, Ms. Javkhlan Munkhbold.
Infographics:	Mr. M. Yasin Janjua, Ms. Gadha Raj Nadupparambil, Mr. Saujan Khapung, and Ms. Genevieve Connell
Layout and design:	Ms. Sarnai Bayarkhuu

FOREWORD

Mongolia has made steady progress in advancing human development, standing out as one of the countries in the region with high human development achievements. However, as this report highlights, recent years have seen a stagnation in human development, as measured by the Human Development Index (HDI), a trend observed globally due to various challenges including pandemic and geopolitical issues. Throughout this period, the Government of Mongolia has remained committed for placing human development at the core of its national agenda, reflected in strategic plans like Vision 2050, the New Economic Recovery Policy, and the Development Action Program 2024–2028.

The newly launched Development Action Program 2024–2028 underscores this focus, aiming to ensure that no one is left behind in Mongolia's energy transformation journey. It emphasizes the creation of a comfortable living environment where all citizens can thrive—becoming prosperous, educated, and healthy. As a resource-rich country, Mongolia holds vast potential in hydro, wind, solar, and thermal energy. Expanding the diversity of energy sources will not only improve access to clean, sustainable energy but also unlock opportunities for economic diversification and create decent jobs for all.

The government is committed to harnessing Mongolia's potential in increasing human development through a range of strategic policy levers that drive regional and local development, foster smart urban planning through "20-minute cities," enhance economic freedom, and improve the business and investment climate. Key areas of focus include economic diversification, environmental protection, climate change mitigation, and the promotion of green finance. These policies are further supported by cross-cutting enablers, including digitalization, good governance, transparency, peace, human rights, and Mongolia's multi-pillar foreign policy approach.

I extend my gratitude to the United Nations Development Programme (UNDP) in Mongolia for their partnership in producing this National Human Development Paper, which brings together the expertise of international and local consultants, peer reviewers, and a broad range of stakeholders. The report sheds light on the generational challenges of achieving a just energy transition while ensuring sustainable human development.

The Government of Mongolia is addressing these challenges through forward-looking policy actions and development programs that aim to improve access to clean and sustainable energy, shaping a prosperous, energy-secure, and resilient Mongolia that benefits all its citizens.

His Excellency
Dorjkhand Togmid,
Deputy Prime Minister,
Government of Mongolia

PREFACE

Since 1990, UNDP's Human Development Reports have brought a people-centred approach to the forefront of global discussions on pressing socio-economic and environmental challenges. The concept of human development, as advocated by UNDP, focuses on expanding people's capabilities and improving their overall well-being. To translate this vision into action, UNDP produces in-depth National Human Development Reports and country-specific papers, addressing key development challenges and igniting high-level policy debates to foster meaningful solutions. These reports not only track trends in human development progress but also offer policy recommendations to enhance education, health, environmental sustainability, and economic well-being. Progress is measured using the Human Development Index (HDI) and an array of complementary indices.

Mongolia has made notable advances in human development since 1990, driven primarily by its coal and copper mining sectors. However, this dependence on mining has limited investments in other areas of the economy, impeding economic diversification. While coal remains a key resource, particularly for energy and heating in Mongolia's harsh winters, its widespread use has led to severe air pollution and environmental degradation. In urban centers, such as Ulaanbaatar and the aimag capitals, the burning of coal, especially in the ger districts, has resulted in critical health issues, particularly affecting children, pregnant women, and the elderly. A transition to renewable energy is therefore vital not only for sustainable development but also for achieving the Sustainable Development Goals (SDGs).

Mongolia's current energy system is aging, inefficient, and heavily subsidized. Moreover, the country's high per capita CO2 emissions and heavy reliance on coal demand a shift towards renewable energy to mitigate the impacts of climate change. This energy transition will, however, affect the entire economy, particularly those industries and individuals deeply entrenched in the fossil fuel sector. A well-managed, just energy transition—one that is equitable and inclusive—will ensure that no one is left behind, minimizing negative impacts while maximizing benefits for all.

Given Mongolia's abundant renewable energy resources and the decreasing costs of renewable technologies, the country is well-positioned to benefit from increasing its clean energy mix. Cleaner energy alternatives, particularly solar-powered heating solutions and heat pumps for ger areas, can significantly reduce air pollution and improve public health. Investment in STEM education, along with skills development and the reskilling of displaced workers, will further ease the transition. Off-grid renewable energy solutions can enhance agricultural productivity and food security for rural farmers and herders, while increasing energy independence and security for the country as a whole. Moreover, the clean energy sector presents new opportunities for economic diversification, creating jobs, particularly for women and youth. Inclusive policies must ensure that vulnerable groups, including migrants and herders, benefit from this transition.

To ensure an efficient and equitable energy transition, Mongolia will need comprehensive regulatory reforms, national and local transition strategies, blended JET and climate finance, investment plans for energy efficiency and renewable energy, and targeted training programs. This will position the country to benefit from foreign investment and international cooperation. A comprehensive Just Energy Transition (JET) strategy and action plan is essential to achieving net-zero emissions by 2050 while improving human development outcomes.

This paper explores how a just energy transition offers Mongolia a unique opportunity to improve health, education, economic resilience, and environmental sustainability, while positioning the country as a leader in global renewable energy development. Through this transition, Mongolia can chart a path toward a prosperous, equitable, and sustainable future for all.

Matilda Dimovska,
Resident Representative,
United Nations Development Program in Mongolia

ACKNOWLEDGMENTS

We are pleased to present the Mongolia National Human Development Paper produced by the staff o f UNDP country office in Mongolia, with contributions from research interns, academics, and consultants. During this process, Ms. Matilda Dimovska Resident Representative UNDP Country Office in Mongolia and Ms. Lin Cao, Deputy Resident Representative provided invaluable support for the preparation, publication and dissemination of the report. The production of the report also received support from Ms. Elaine Conkievich, former Resident Representative UNDP Country Office in Mongolia, and Ms. Nashida Sattar and Lazima-Ontta Bhataa former Deputy Resident Representatives UNDP Country Office in Mongolia.

The report also benefited immensely from the peer review feedback and inputs of Phillips S. (Chief Economist, UNDP RBAP), Mizuho Okimoto Kaewtathip, Sudyumna, Devika Iyer form UNDP RBAP, Jonathan Pincus (UNDP Economist Vietnam), Yanchun Zhang, Seockhwan Bryce Hwang, Nicole Igloi from the Global Human Development Report Office (HDRO), Ana Rojas form UNDP Sustainable Energy Hub, Ana Arkhangelskay (senior consultant UNDP Kyrgyzstan), Cecilia Vuyk of UNDP Paraguay, Khishigjargal Kharkhuu, Saruul Dolgorsuren, and Rebecca Dawson (UNDP), and Professor Seeta Prabhu UNDP Consultant. Special thanks are due to UNP team mates Mr. Delgernaran Tumurtogoo, Ms. Ergugu Su, Ms. Jingyou Zhang, for operations support and Mr. Erdenesukh Otgonbayar, and Ms. Ainur Aibyek for the communication support.

We are also indebted to our technical committee members for carefully reviewing the paper and providing comments and feedback which helped us improve several sections of the paper. Especially we are thankful to Mr. Gan Ochir (Chief Economist Bank of Mongolia) for carefully reviewing the paper and providing detailed comments, and Mr. Alfredo Bano Leal (Asian Development Bank) and Ms. Doljinsuren Myagmar (Ministry of Environment and Climate Change). The other technical committee members who have provided significant feedback include, Lkhagvasuren Enkhtur and Ms. Dava (New recovery policy Accelerator), Enkhtuya Gombosuren (Energy regulatory commission), Erdenebat Ts (Ministry of Energy), M. Tumenjargal (Mongolia Energy Economic Institute), Matthieu David Le Blan (Global Green Growth Institute), Edward Faber (Asian Development Bank), Mungunkhishig Batbaatar (People in Need), Sangwon Lin (United Nations Resident Coordinator Office), Yanqin Song (World Bank), Dunja Hoffman (GIZ), Luke Mackle (OECD), Khishigt Tamir (Newcom), and Tsevegmid Tumentsogt (Business Council Mongolia).

Our sincere appreciation is also extended to our stakeholders who participated in our consultations and validation workshops and provided valuable information. These include representatives from development partners, government, the private sector, civil society, and academia. Noteworthy participants included Mr. Altantulga (Ministry of Labour and Social Protection), Ms. S. Erdenetsetseg (Ministry of Environment and Climate Change), Batmunkh Enkhtur (Ministry of Finance), Delgerjargal (Ministry of Finance) Mr. Baldorj (Ministry of Energy), Mungunsukh (Ministry of Economy and Development), Mrs. Bumangerel Tsagaan-Uvgun (Ministry of Education and Science's) Dr. Oyun-Erdene (Environmental Pollution Expert), Ch. Myagmardorj (National Center for Public Health), Ms. Annaka Peterson (GGGI), Mr. Bayarkhuu Chinzorigt (GGGI), Jambaa Lkhagva (Abt-Associates), Kate Hughes (ADB), Jairus Carmela C. Josol (ADB), Mr. Hannes Takacs (EBRD), Bulgantamir (PIN), Mr. Ganbaa Nyamaa (Independent Energy Efficient Building Expert), Dr. Batzorig Bayartsogt (National University of Medical Science), Otgonbaatar Jambaljamts (MRIA), Khulan Tumurbaatar (MRIA), Khurelbat Banzragch (MRIA), and Gankhuyag (Newcom).

M. Yasin Janjua,
Country Economist
United Nations Development Program in Mongolia

Table of contents

LIST OF FIGURES

LIST OF TABLES

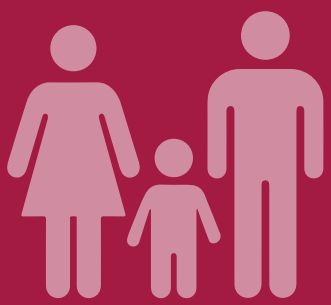
LIST OF BOXES

Abbreviations

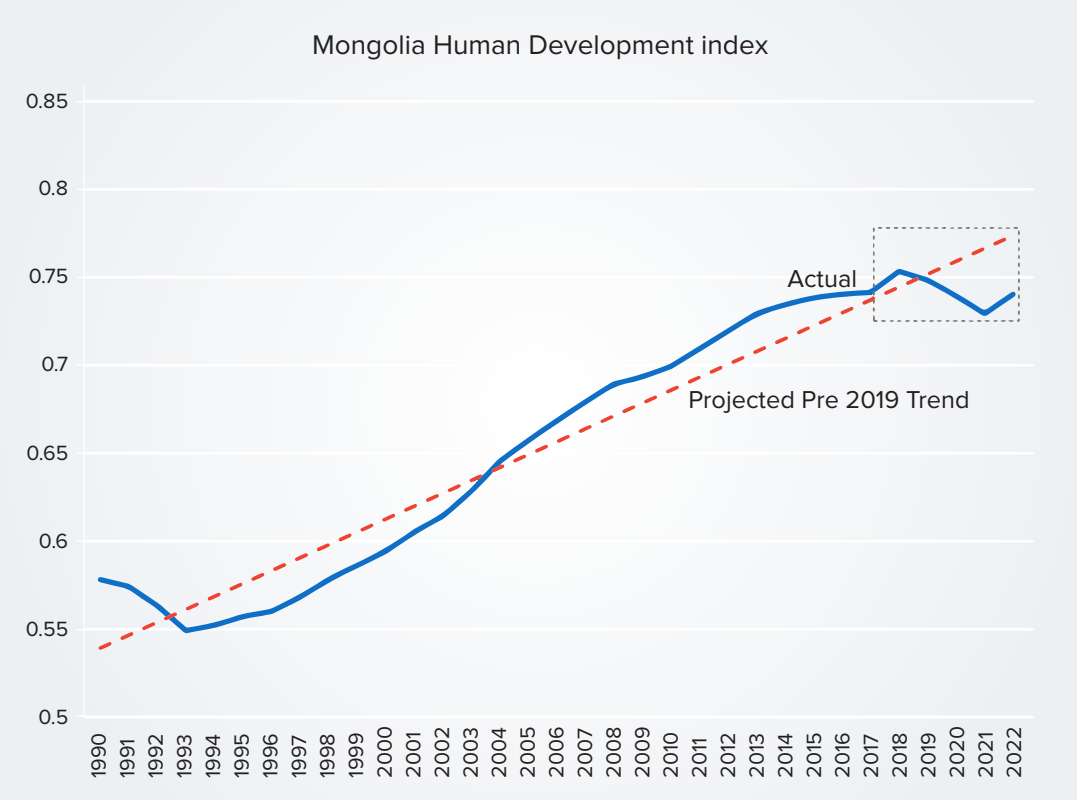
ADB	Asian Development Bank
AI	artificial intelligence
BEAT	best energy alternative technology
CHP	combined heat and power plant
CO2	carbon dioxide
COVID-19	coronavirus disease 2019
CSP	combined solar PV
EBRD	European Bank for Reconstruction and Development
ERC	Energy Regulatory Commission
ERIA	Economic Research Institute for ASEAN and East Asia
FTE	full-time equivalent
GDI	gender development index
GDP	gross domestic product
GGGI	Global Green Growth Institute
GII	gender inequality index
GIZ	The Deutsche Gesellschaft für Internationale Zusammenarbeit
GNI	gross national income
GSNI	gender social norms index
HD	human development
HDI	human development index
HDR	human development report
HDRO	Human Development Report Office
HVAC	heating, ventilation, and air conditioning
ILO	International Labour Organization
IRENA	International Renewable Energy Agency
JET	just energy transition
JETP	just energy transition partnership
kWh	kilowatt hour
LCOE	levelized cost of energy
LFS	labour force survey
LRMC	long-run marginal cost
MICS	multiple indicator cluster survey
MPI	multidimensional poverty index
MNT	Mongolian tugrik
MRIA	Mongolian Renewable Energy Association
MW	megawatt
NHDR	national human development report
NOx	nitrogen oxides
NSO	National Statistical Office
OECD	Organization of Economic Cooperation and Development
O&M	operations & maintenance
PIN	People in Need
PV	photovoltaic
SDG	Sustainable Development Goal
SMEs	small and medium enterprises
SO2	sulphur dioxide
STEM	science, technology, engineering, and mathematics
TVET	technical and vocational education and training
TWh	terawatt hours
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
WHO	World Health Organization
NDC	nationally determined contribution

OVERVIEW

A JUST ENERGY TRANSITION FOR HUMAN DEVELOPMENT IN MONGOLIA

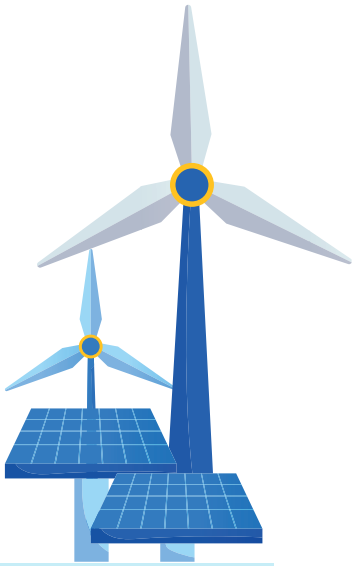


Inner Cover Art: The inner cover art graphics concept follows the classical HDR style using an abstract highlight from the data. The cover is derived from a chart of Mongolia's human development index (HDI). The red dotted line represents the pre-pandemic trend between 2017 and 2022. Had this continued, Mongolia would have progressed to the 'very high human development' category. The blue line traces the actual values of the HDI. The area shaded in red captures the loss in HDI value caused by the pandemic during the period 2019 to 2022.



Source: UNDP Human Development Report Data Centre

A JUST ENERGY TRANSITION FOR HUMAN DEVELOPMENT IN MONGOLIA



Mongolia has made steady progress in human development – with industrial advances driven largely by the production and export of coal and copper. But in recent years progress has faltered, and the intensive burning of fossil fuels has damaged health and added to emissions of greenhouse gases. The dependence on fossil fuels has also limited employment options. Mongolia needs an energy transition from fossil fuels to renewables. But since it could have a disproportionate impact on different groups, so there should be a fair and just approach that leaves no one behind. Such a 'just energy transition' would strengthen human development, setting Mongolia on a low carbon emissions path to the Sustainable Development Goals.

Human development is about expanding people's capabilities and improving their wellbeing. People and communities should not be passive beneficiaries of development but active agents of change, engaging fully in economic, social, and political life, while remaining committed to a healthy environment and careful stewardship of the planet.

This paper considers the policies that would be needed to achieve a just energy transition (JET) for human development for current and future generations. To do so, it presents the state of human development in Mongolia, and explores the impact of Mongolia's coal-driven economy on human capacities and capabilities . Hence, it reviews the energy sector challenges and how long-term fossil fuel dependence in the energy sector contribute to emissions and related climate uncertainties that are negatively impacting human development and the economy. Finally, it makes the case for just energy transition and possible energy transition choices along with a policy framework that is needed to actualize JET and human development. It identifies a JET as an essential element to counter the negative impact of transition, thus fostering human development and taking into account equity within and between generations.

Such a transition carries significant economic and social challenges as there will be both beneficiaries and people adversely affected. Investments made in fossil-fuel systems will become sunk costs, and jobs may shift or disappear, posing new challenges and opportunities in livelihoods, health, education, and skills-development systems. A just energy transition that embodies social, economic, political and environmental aspects is thus more than a technical shift; it also aims at managing the culture of human development around the change, by investing in education, health, and the environment.

The state of human development in Mongolia

Mongolia is the world's second-largest landlocked country, with a population of 3.4 million growing by roughly 1.9 percent annually.[1] Around half the population live in the capital, Ulaanbaatar; the rest are widely dispersed over a vast territory with a population density of 2.2 people per sq km.[2] The country has 897,000 household dwellings; of these, 61 percent are houses or other buildings, while 38 percent are traditional 'gers' – made from wooden lattices and poles covered in layers of felt made from animal hides, and sometimes further layers of canvas.[3]

Over recent decades, Mongolia has made steady progress in human development with promising achievements in health, education, and income. However, in recent years progress has faltered as measured by the human development index (HDI). The HDI had risen steadily until 2018, but then started to decline and by 2022 it had still not recovered to its 2016 level.[4]

Human development progress has partly been enabled through economic growth. Between 2009 and 2023, GDP per capita rose from $1,718 to $4,040. Growth has created more jobs, but most are in low-paying sectors. Around half the employed population work in the service sector, 25 percent in agriculture, and 22 percent in the production sector. Only 5 percent are in mining (7 percent of men and 2 percent of women). In September 2023, the overall unemployment rate was 5.2 percent. There is also a clear urban-rural divide. Unemployment is highest, 15 percent, in Govi Altai province, followed by 13 percent in Bayankhongor.[5]

The women's labour force participation rate was only 52 percent, compared to men at 66 percent. And though women tend to have better education rates than men they only occupy 43 percent of managerial positions, and they face a gender wage gap of 6.7 percent.[6] Women are less likely to be in the labour force because of unpaid domestic and care demands. But they are also hindered by gender stereotyping, gender segregation in higher-paid occupations, and the early female retirement age.

Mining, whether for coal or for metal ores, is a major part of Mongolia's economy. In 2023 when the GDP grew by more than 7 percent, the mining sector provided 28 percent of the added value. Mining and quarrying account for over 90 percent of exports and for 74 percent of foreign direct investment. However, mining creates relatively few jobs.[7]

Mongolia's economic landscape is also dominated by deep-rooted agricultural traditions and nomadic societies. In 2023, agriculture contributed around 10 percent of value added and absorbed over 22 percent of the labour force. The average annual income of a herding household is around $5,000, which is on par with the national average, but their incomes depend on the types of animals a family keeps and their proximity to urban centres.[8] On average, earnings from the sale of milk constitute a third of the income. When herders are unable to sell their milk, many resort to selling their livestock. The absence of state support, especially since the fall of communism in 1990, has left herders to fend for themselves. As of 2019, many were in debt. The majority of nomadic herders are vulnerable to climate related disasters, especially extreme winter weather conditions called 'dzud'.

After losing their livestock, herders have no other sources of livelihood, and they tend to migrate to urban centres in search of menial jobs.

Among vulnerable populations, are the large number of households in aimags outside the capital who particularly rely on jobs in mining and herding livestock, reindeer and other animals, which limits their economic mobility and makes them vulnerable to industry-specific downturns and extreme weather conditions, underscoring the need for economic diversification and their integration in resilient economic activities.[9]

Large-scale migration

The culmination of these pressures has led to significant migration to urban centres. In the past three decades, around 20 percent of Mongolia's population has moved to Ulaanbaatar which now houses over 1.6 million people, around half the country's population. In addition, one out of 11 Mongolians is living abroad, of whom 65 percent migrated for economic reasons.[10]

Initially, most migrants moved to the Central Region before ultimately settling in Ulaanbaatar. Annually, over 60,000 people migrate to the city, often bypassing intermediary options like soum or aimag centres due to a lack of economic opportunities at local level. Upon arrival in Ulaanbaatar, migrants face a host of challenges and various forms of discrimination, including limited access to basic amenities and services.

Most migrants reside in ger districts not connected to the city's water and sanitation infrastructure or centralized heat supply. Ger residents manage their own pit latrines and get clean water from local water kiosks, transporting it home by hand or on small carts. Compelled to burn coal for survival, they are unjustly stigmatized as the primary culprits behind the city's deteriorating air quality. This blaming exacerbates their vulnerability even though the root cause of the pollution is systemic poverty and a lack of urban infrastructure.[11]

Dangerous air pollution

Air pollution has been a long-standing issue, particularly in Ulaanbaatar. The city's unique conditions, including its status as the world's coldest capital, and reliance on coal-powered heating, make it one of the world's most air-polluted cities. The burning of coal in ger area houses is responsible for more than 80 percent of air pollution in winter, with the rest attributed to combined heating and power systems and the transport sector.

Air pollution poses severe health risks, with pregnant mothers and foetuses being critically vulnerable. Children in Ulaanbaatar are more prone to bronchial inflammation, with rates five to fifteen times higher than those of their rural counterparts. The statistics are grim: in 2015, 435 children died from pneumonia; and by 2018, one in every five pneumonia deaths was a child under five.

In 2022, the economic cost of illness attributed to ambient air pollution in Mongolia amounted to $1.15 billion. On average, the cost per death was $386,980, with acute lower respiratory illness accounting for the largest proportion, followed by diabetes and stroke. This economic burden represents 8 percent of national GDP.[12]

Progress in poverty and inequality

Gains in human development in earlier decades were accompanied by unprecedented declines in poverty and inequality. During the economic boom of 2010–2014, the headcount poverty ratio fell, and by 2018 was 28 percent. Poverty can also be assessed using the national poverty line, which is set at $66 per month in 2018 dollars. In 2020, the national poverty rate was 27 percent.[13] People can, however, be deprived in many other aspects of their lives beyond income. To reflect this, a broader measure of poverty is the multidimensional poverty index (MPI) – which measures deprivation along ten indicators, covering income, education, and basic infrastructure services. If a person is deprived in a third or more of ten indicators, they

are characterized as 'multidimensionally poor'. In 2018, 7.3 percent of the population (256,000 people) were multidimensionally poor while a further 15.5 percent were classified as vulnerable to multidimensional poverty.[14] Thus, although Mongolia has seen an overall improvement in human development, the benefits have not been distributed equally. To capture some of these imbalances, UNDP has developed the inequality-adjusted HDI (IHDI). The IHDI discounts the HDI by a factor which reflects inequalities in income, education, and life expectancy - in 2021 this factor was 13 percent, which is the same as that of Tajikistan but higher than that of Kazakhstan (7 percent).[15]

There has also been some reduction in gender inequality. One measure of this is the gender development index (GDI) which is the ratio of the female and male HDIs. In 2022, the female HDI value was 0.751 while for males it was 0.728, resulting in a GDI value of 1.032. This places Mongolia in the high-GDI group. Nevertheless, women still face different types of discrimination. This is reflected in the gender social norms index (GSNI) which measures how social beliefs obstruct gender equality in areas like politics, work, and education. Based on gender social norms, most people in Mongolia have at least one bias against women's empowerment.[16]

Severe climate impacts and environmental degradation

With a small population, Mongolia is responsible for only 0.12 percent of global carbon emissions but ranks 17th among the world's highest per capita CO_2 emissions at 11.2 tons (2022), largely because more than 90 percent of its energy needs are met from coal.[17] Since 1990, Mongolia's energy related GHG emissions have increase by 59.6 percent.[18] As well as contributing to global warming, Mongolia also experiences the consequences. Between 1940 and 2015, average temperatures rose by more than 2 degrees, which is higher than the global average. Climate change has led to increased frequency of extreme weather incidents making Mongolians vulnerable to disasters, which along with higher temperatures are threatening Mongolia's lively herding traditions, tourism, agriculture, and ecosystem. Beyond the direct emissions, non-renewable forest loss, was estimated at 436,000 hectares in 2023.[19] This loss is likely tied to the use of wood and other biomass materials as fuel for cooking and heating.

To take account of environmental degradation, UNDP has developed the planetary pressures adjusted HDI (PHDI) which discounts the HDI based on per capita CO_2 emissions and the country's material footprint. In 2022, the PHDI for Mongolia was 16 percent lower than the HDI – the highest discount among neighbouring countries.[20]

Mongolia's coal-based energy system

Mongolia has high-quality coking and ignite coal deposits, estimated at 165 billion tonnes. In 2023, the country produced 81 million tons of coal, a 118 percent increase from the previous year, of which 70 million tons was exported, mostly to China.[21]

Coal forms the basis of a distinctive energy system, which in Ulaanbaatar is used for a centralized system for combined heat and power plants. Besides, coal is used in household stoves for coal-fired heating in the distinctive ger (yurt) housing areas unevenly scattered around Ulaanbaatar's suburbs. The energy system takes advantage of an abundant natural resource but is inefficient, and bad for human health and the climate and leaves the country vulnerable to external shocks.

Around 72 percent of energy is produced by the combined heat and power plants supplying hot water and steam for heating buildings, and some from renewables, but around one-fifth of electricity is imported from China and Russia.[22] Electricity consumption has now overtaken domestic production, leaving gaps that need to be filled by imports. This situation is likely to get worse. Between 2020 and 2050, electricity demand is forecast to double.[23]

A crisis of energy governance

Consumer electricity demand has surpassed production, which has added to the stress on electricity generation and distribution systems. In winter 2023-24, this resulted in frequent blackouts in certain areas. Further, consumer energy tariffs are low. Energy provision, of both heat and electricity, is highly subsidized and does not fully recover the cost of production.[24]

For the future, coal will not remain the cheapest or most reliable option for energy sustainability and security. This is because of falling renewable prices. In 2010, globally, solar PV renewable power generation was 710 percent more expensive than the cheapest fossil fuel-fired solution; but by 2022 it cost 29 percent less. The existing coal-fired power plants, some of which have been in operation since the 1960s and 1980s, are likely to become economically unviable.[25] Renewable power generation, such as solar and wind, offers a hedge against future fuel price uncertainties. Once the initial investment is recuperated, renewables provide power at a stable, low cost almost perpetually – along with substantial health, safety, and environmental benefits.[26]

The confluence of global energy trends, the aging infrastructure of existing coal facilities, and the inexorable rise of renewables emphasize the need for transitioning away from coal and embracing more sustainable and economically viable energy sources everywhere, including Mongolia.[27]

Subsidizing low consumer prices

Mongolia is subsidizing residential electricity and heat consumption for consumers, including the use of modified coal briquettes by ger area residents. This has resulted in uncontrolled use of energy by households. With low heat charges in the central district heating, and the absence of heating controls or a metering and billing system, people have little incentive to conserve energy.

Mongolia spent MNT 37,740 billion on electric energy subsidies in 2023, an increase of 120 percent over 2018.[28] Fossil-fuel subsidies are regressive, in that they offer the greatest benefits to high-income consumers. Nevertheless, a suggested increase in energy tariffs will worsen the economic wellbeing of the people living below or around the poverty line. Any tariff increase would impact vulnerable populations severely, hence such actions must be taken gradually and accompanied by targeted energy social protection measures.

Benefits of a just energy transition

An energy transition in Mongolia from fossil fuels to renewables will need to reallocate resources and wealth, which will likely result in inequalities among beneficiaries and people adversely affected including those who have invested in the fossil-fuel economy. To ensure fairness the Government will therefore need to intervene – aiming for a transition that benefits all stakeholders and leaves no one behind. A truly just energy transition would set Mongolia onto a new human development trajectory.

A JET does not just mean phasing out fossil fuels but also phasing out the political, cultural, and social legacy that favours carbon-intensive choices for economic decision making.

To ensure that the discussions are comprehensive, Mongolia needs to engage all stakeholders with eagerness and vigour to negotiate a JET framework around socio-economic issues – related to a coal phase-out, energy costs and subsidies, labour relations, and policy and regulatory obstacles, with particular concern for gender equality.

The following sections summarize the main human development opportunities.

A healthier and more productive population

A JET encourages cleaner alternatives, such as solar photovoltaic systems, electric stoves and heaters which can substantially reduce pollution levels. Better air quality offers immediate respiratory benefits and safeguards the health of Mongolia's population.

Modernized agriculture and food security

A JET presents an opportunity for modernizing agriculture while boosting food security. Herders, for example, can shift to solar-powered wells and sheds. Renewable energy can also displace diesel in agricultural and food processing – for example, in water and drip irrigation hydroponics and aquaponics systems in greenhouses.

A future-fit education system

A JET transition will mean moving to more sophisticated technologies, for which Mongolia will need to build critical skills, by increased investments in education, especially in the STEM subjects of, science, technology, engineering, and mathematics.

Greater energy security

Investing in a JET would help build a more decentralized and secure energy system. According to the International Renewable Energy Agency (IRENA), the combined wind and solar potential is estimated at 2.6 terawatts (TW). Based on different estimates this could translate into 7,300 to 15,000 TWh of electricity production per year which could meet the needs of neighbouring China by 2030.[29] While energy self-sufficiency remains paramount, by exporting excess renewable energy via a future 'Northeast Asia Grid', Mongolia could become an energy-exporting powerhouse.

A more diverse economy

Low-carbon electricity, heat and energy efficiency technologies can help diversify the economy and create more jobs. These technologies are related to heat pumps, energy storage, geothermal, biogas, recycling waste to heat energy, green hydrogen, battery storage connected via smart mini-grids, and green and passive housing. In Ulaanbaatar, electric and hydrogen fuel-cell buses would dramatically reduce the city's carbon emissions while spurring local manufacturing units.

Sustainable mining of energy transition minerals

Mining operations can replace conventional electricity sources with solar and wind energy, and green hydrogen. Just as important, Mongolia can be a major exporter of minerals critical for global renewable energy needs – including copper, fluorspar, lithium, gold, iron, tungsten, molybdenum, uranium, zinc, and 15 rare earth elements. Moreover, instead of exporting raw ores, the country should process more minerals domestically.

More diverse employment

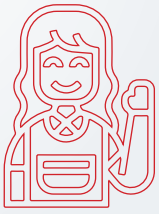
Compared with fossil-fuel energy generation, clean energy systems can create three times as many jobs for the same investment. Globally, renewable energy, hydropower, and waste-to-energy generation are known to create up to 7.7 full-time equivalent jobs per $1 million invested, compared to only 2.7 full-time equivalent jobs for fossil-fuel investment.[30]

Stronger regional development

Nomadic herders can benefit from off-grid solar power. By channelling more investments into solar projects in the Eastern and Western region, for instance, in Bayan-Ulgii, Mongolia can create multiple and immediate job opportunities in installation, maintenance and operations. Another Western province, Zavkhan, stands to benefit immensely from wind-energy projects. Renewable energy can power rural small and medium enterprises (SMEs) – for example in greenhouses, vegetable processing and pickling, dairy farms, meat processing, frozen vegetable processing, aquaponics, and livestock husbandry in the Eastern Provinces.

More opportunities for women

A gender-just energy transition would mean changing cooking methods to use clean fuels and technologies. This will not only reduce indoor air pollution but also reduce the time and labour burden on women. Women may also be more attracted to working in a sector perceived to be more socially and environmentally sustainable. For this they require education and training programmes. But energy and mining companies will also need to alter their corporate cultures to enable women to grow their careers.



Empowering migrants

The JET should incorporate the lived experiences of migrants and catalyse infrastructure development in soum and aimag centres making them more appealing for migrants for long-term settlement. This could also catalyse the development of more sophisticated and sustainable waste management systems, such as composting toilets or small-scale sewage treatment facilities, and extend to other areas of human development, including hygiene, healthcare, and overall wellbeing, thereby reducing the systemic vulnerabilities that migrants face.

Inclusion of vulnerable households across Mongolia

A JET would support the most vulnerable households by creating opportunities for them in the capital city and aimags. Ulaanbaatar has the largest household population followed by Khangai, Central, Western and Eastern regions. Capitalizing on renewable sources like solar, wind, and geothermal energy will attract investment across Mongolia in other sectors such as tourism and small-scale industries, reducing dependence on animal herding. Involving the vulnerable populations in aimags in decision-making processes can empower them economically and socially.

Uplifting herder communities

Renewable-powered energy-efficient sheds could maintain stable temperatures for livestock during Mongolia's harsh winters and would support herder transitions to livestock farming businesses. Another avenue is milk powder production powered by renewable energy. Biogas generated from livestock manure can also be converted into biomethane to fuel combined cycle gas turbines in areas where this is feasible.

A JET thus embodies a comprehensive transformation towards sustainable energy. This aligns with the objectives of SDG 7, which emphasizes access to affordable, reliable, sustainable, and modern energy for all, but also connects with the achievement of various other SDGs, notably those concerned with poverty reduction, employment, and gender equality.

A just energy transition in action

A well-planned and just energy transition can make a strong contribution to human development – through social, economic, and environmental channels. By focusing on skills, worker protection, social equality, and active participation – and employing a whole-of-society approach – Mongolia can distribute the benefits and costs fairly among all actors.

Policies for a JET in Mongolia

A just energy transition would empower communities, opening safe public spaces for discussion on the transition from coal, expanding people's capabilities, creating decent work opportunities, and offering the prospect of a brighter future for all.

While a JET is essential, it will not be easy. Mongolia faces barriers in attracting finance and lacks much of the technical knowledge and skills related to renewable energy. The population is aware of the value of renewable energy and now has a greater understanding of its potential in economic diversification. But there remain barriers to adoption that need to be addressed through the policy and regulatory environment. In addition, there are persistent gender inequalities. If not well planned, the JET process could lose integrity causing stakeholder mistrust and delays and reversion to 'business as usual'.

These hurdles are by no means insurmountable and can be tackled systematically. The table below summarizes key policy initiatives. The most important step is developing a people-centred JET strategic framework, with a net-zero 2050 focus, and a related investment action plan.

JET-related policy options and timeframes

Policy Intervention	Short-term	Medium-term	Long-term
Strategic institutional and governance measures 	• Development of JET strategy and action plan. • Coal phase-out plan for ger districts. • Create inclusive space for dialogue, and adopt co-creation approaches, and transparency.	• Promote effective coordination among different stakeholders within the public and private sectors. • Build leadership capacity. • Decentralize and liberalize energy production and distribution – transition from the single buyer and seller to a multiple buyer and seller market. • Increase the role of the private sector in energy governance. • Implement future-fit governance. • Implement independent audits, accountability, anti-corruption, and risk management of JET.	
Legal, regulatory, and standardization measures 	• Review and update energy regulations and laws. • Introduce a mini-grid regulatory framework. • Develop carbon credit mechanism frameworks and emissions trading systems.	• Revise and localize energy efficiency and energy conservation standards and implement gradually. • Setup mechanisms for verification, validation, and implementation of energy efficiency standards across the country. • Develop monitoring verification and reporting (MRV) systems for the energy sector. • Develop and introduce best energy alternative technology (BEAT) framework.	

Policy Intervention	Short-term	Medium-term	Long-term
Energy infrastructure 	• Support renewable energy and energy efficiency solutions for households and SMEs in the ger areas of Ulaanbaatar as well as aimags.	• Develop off-grid and on-grid renewable energy and mini-grid solutions/ infrastructure. • Develop green housing, expanding off-grid renewables. • Upgrade the national grid and distribution network. • Implement renewable energy and hydroelectric projects. • Undertake green energy-efficient housing and transport infrastructure development.	
Sustainable finance 	• Develop JET financing framework.	• Promote blended climate finance for financing energy transition projects, including renewable energy and energy efficiency.	
Fiscal policy 	• Results-based budgeting in JET sectors of the economy. • Revise carbon taxation framework	• Gradual introduction of carbon taxes. • Gradual phase-out of coal and energy subsidies to build a fiscal surplus for de-risking renewable energy and financing social protection.	• Implement carbon taxes in all sectors. • Create fiscal space for financing green energy and attracting FDI.
Economic measures 	• Socio-economic analysis including social accounting matrix modelling, and social protection mapping surveys. • Increase tariffs with a phased approach gradually for full cost recovery. • Fair negotiation of energy and JET contracts. • Operationalize mechanism for renewable energy auctions to benefit from lower production prices.	• Support de-risking of renewable energy investments by redirecting subsidies to households and businesses for adopting renewable energy solutions.	• Promote investment in sustainable critical energy transition minerals mining.

Policy Intervention	Short-term	Medium-term	Long-term
Innovation 	• Invest in research, innovation, and develop local energy solutions, e.g. energy-efficient insulation from local materials	• Introduce demand-side programmes for improving energy efficiency to lessen the impact of tariff increases. • Build modern smart AI grid management infrastructure in cities. • Introduce and manage smart energy infrastructure for a nationwide grid.	
Social Protection 	• Provide targeted social protection measures to vulnerable households impacted by tariff increases.	• Introduce future skills and cash-for-work for displaced workers	
Skills of future 	• Skill mappings of vulnerable sectors affected by a JET. • Design a national qualification framework for emerging skills and formulate training programmes.	• Skills training and employment placement programmes for youth and women in the emerging sectors of the economy. • Retrain people who lose their jobs.	
Empowerment 	• Integrate vulnerable groups in decision making and project planning, especially women, youth, and those who would be affected by a JET. • Introduce and step-up behavioural change programmes.	• Promote social entrepreneurship for energy efficiency and energy conservation.	
Behavioural change communication 	• Introduce behavioural change communication and public awareness programmes with respect to renewable energy, fossil-fuel phase out, energy efficiency and conservation, and targeted social protection.	• Assess the impact of communication and behavioural change programmes and update the messages based on communication needs.	
International cooperation 	• Support dialogue for breaking cooperation gridlocks. • Attract foreign direct investment.	• Support COP28 implementation of commitments on tripling renewables and develop a fossil-fuel phase-out net zero plan.	• Export energy to neighbouring countries.

The new Government is however, developing a new energy transition plan as part of the New Action Program 2024-2028, which will likely address some of the issues. The Action program will involve developing Western region as an energy diversified zone, 20-minute smart cities, economic diversification and liberalisation, and climate change focusing on green financing. And by placing a larger emphasis on human development it will likely build the momentum for just energy transition.

Thus, for Mongolia a JET is a human development imperative that will have far-reaching consequences for the nation's public health, economic resilience, social equity, and environmental sustainability. It could also place Mongolia at the forefront of global renewable energy development through mining and processing materials essential for sustainable energy equipment.

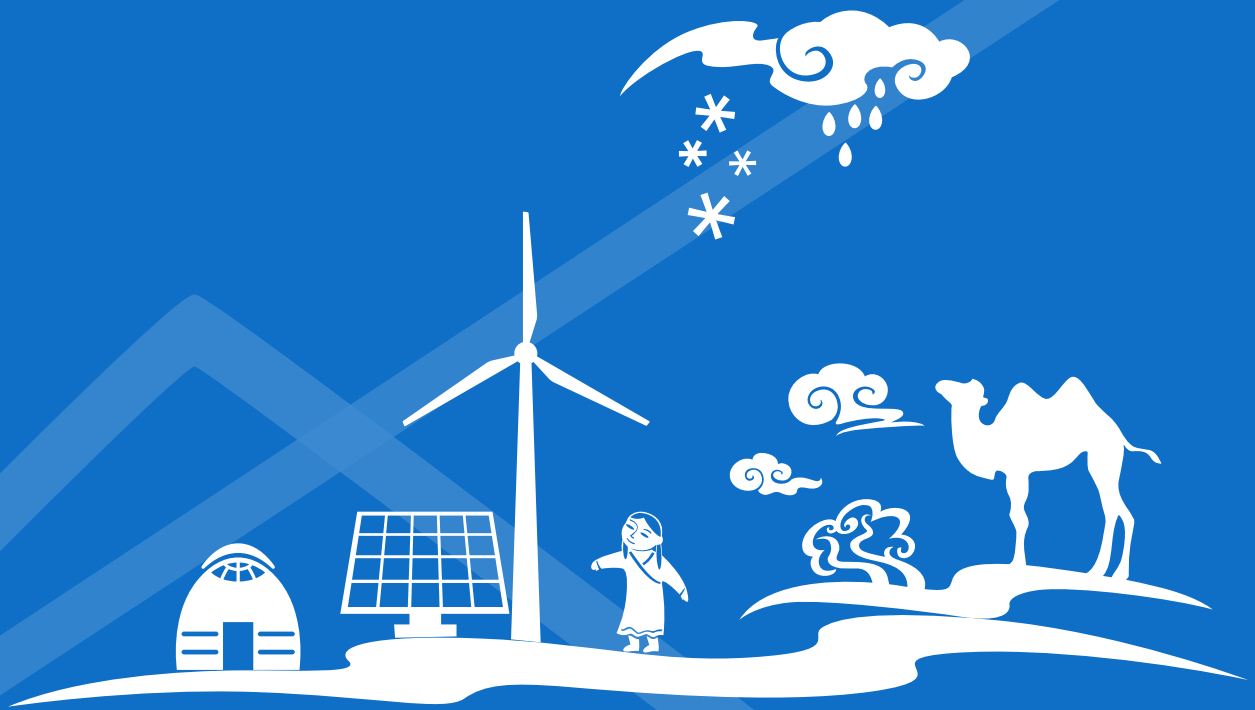
A people-centred JET, based on the principles of human development would cut dependence on coal and boost levels of health, education and skills – and provide decent and greener work opportunities for women, youth, minorities, and vulnerable populations, and offer a brighter future for all.

Endnotes and references

1 (NSO, 2024a)
2 According to the NSO 2020 Population Census, the total population size is 3.5 million inhabitants.
3 For statistics, please refer to (NSO, 2024a)
4 (UNDP, 2024e)
5 (NSO, 2024a)
6 ibid
7 ibid
8 ibid
9 (Menard, 2020), (Kingsley, 2017), and (Mendee, Altanzaya, & Undrakh, 2022)
10 (Kingsley, 2017) and (IOM, 2023)
11 ibid
12 (UNDP, 2019), (UNICEF, 2020), and (UNICEF, 2023)
13 (UNDP, 2024a)
14 (UNDP, 2023a)
15 (UNDP, 2024e)
16 ibid
17 (World Bank, 2023a)
18 (GOM, 2023a)
19 (Global Forest Watch, 2024)
20 (UNDP, 2024e)
21 (ERC, 2023a), (ERC, 2023b)
22 ibid
23 (GIZ, 2020a) and (GIZ, 2024)
24 (ERC, 2024)
25 (IRENA, 2023b)
26 (IRENA, 2023)(IRENA 2023a)
27 (Deloitte, 2016)
28 (ERC, 2023b)
29 (IRENA, 2023) and (ADB, 2020b)
30 (ESCAP, 2024)

CHAPTER 1.

THE STATE OF HUMAN DEVELOPMENT



THE STATE OF HUMAN DEVELOPMENT

Mongolia has made steady progress in human development – with industrial advances driven largely by its production and export of coal and copper. But in recent years progress has faltered, and the intensive burning of fossil fuels has damaged health and added to emissions of greenhouse gases. The dependence on fossil fuels has also limited employment options. Mongolia needs an energy transition from fossil fuels to renewables, but this could have a disproportionate impact on different groups, so there should be a fair and just approach that leaves no one behind. Such a 'just energy transition' would strengthen human development, setting Mongolia on a low-carbon emissions path to the Sustainable Development Goals.

Mongolia, along with the rest of the world, has been passing through turbulent times.[1] The global community has mostly recovered from the COVID-19 pandemic, but continues to suffer from the lingering social and economic setbacks, and human development choices are threatened by future pandemics as well as by geopolitical tensions and energy price shocks. Looming above all this is the climate crisis, from which Mongolia has already suffered. In recent years there have been more incidents of extreme cold weather ('dzud'), wildfires, and flash floods.[2]

Human development is about expanding people's capabilities and improving their wellbeing (Box 1-1).[3] People and communities should not be passive beneficiaries of development but active agents of change. If offered opportunities and choices, they can engage fully in economic, social, and political life, and in building human security – while remaining committed to a healthy environment and careful stewardship of the planet for future generations.[4] The human development paradigm is complemented by other conceptual frameworks, related to environmental progress, human rights, human security, gender social norms, and human happiness.

This report considers the policies that would be needed to achieve a sustainable energy transition for human development for current and future generations.[5] It explores the impact of Mongolia's coal-driven economy on human capacities and capabilities and the possible energy transition choices. While there are many other ways to increase human development, this paper specifically identifies a just energy transition as an essential element for supporting human development taking into account equity within and between generations.[6]

BOX 1-1 The principles of human development

Source: UNDP Human Development Report Office

During the latter half of the 20th century, there was a growing realization that economic growth alone did not adequately capture people's wellbeing and their quality of life. This led to calls for an alternative approach that considered factors such as freedom, equality, employment, basic needs fulfilment, and redistribution of welfare.

In response in 1990, economist Mahbub ul Haq, working at UNDP, introduced the principle of 'human development' which is anchored in Nobel laureate Amartya Sen's work on human capabilities, often framed in terms of whether people are able to "be" and "do" desirable things in life. The human development approach embraces the richness of human life and prioritizes fair opportunities and choices for all.[7] Human development reports and discussion papers from UNDP place a large emphasis on people and on expanding their opportunities and choices for improving their wellbeing.

Human development means establishing a favourable environment that enables individuals to make choices conducive to leading healthy, fulfilling lives in a clean environment.[8]

In this concept, income growth is not considered as an end but rather as a facilitator, a means to an end. Just as important are concerns for voice, agency, and environmental quality. In brief, human development seeks to enhance people's capabilities, giving them the freedom and opportunities to make choices to live the lives they value.[9]

To measure progress on human development, UNDP introduced the human development index (HDI), a composite measure calculated as the geometric mean of normalized indices for three key dimensions of human development: a long and healthy life, being knowledgeable, and having a decent standard of living.[10]

It is important to note that the HDI, is a limited measure. It does not capture the full richness of human development – including issues such as the protection of the environment, or human freedom and rights. Some of these aspects are, however, addressed in complementary indices.

BOX 1-2 National human development reports in Mongolia

1997: National Human Development in Mongolia

2000: Reorienting the state

2003: Urban-Rural Disparities in Mongolia

2007: Employment and Poverty in Mongolia

From vulnerability to sustainability: Environment and Human development

2016: **Building better tomorrow:** Including Youth in the Development of Mongolia.

Human development performance

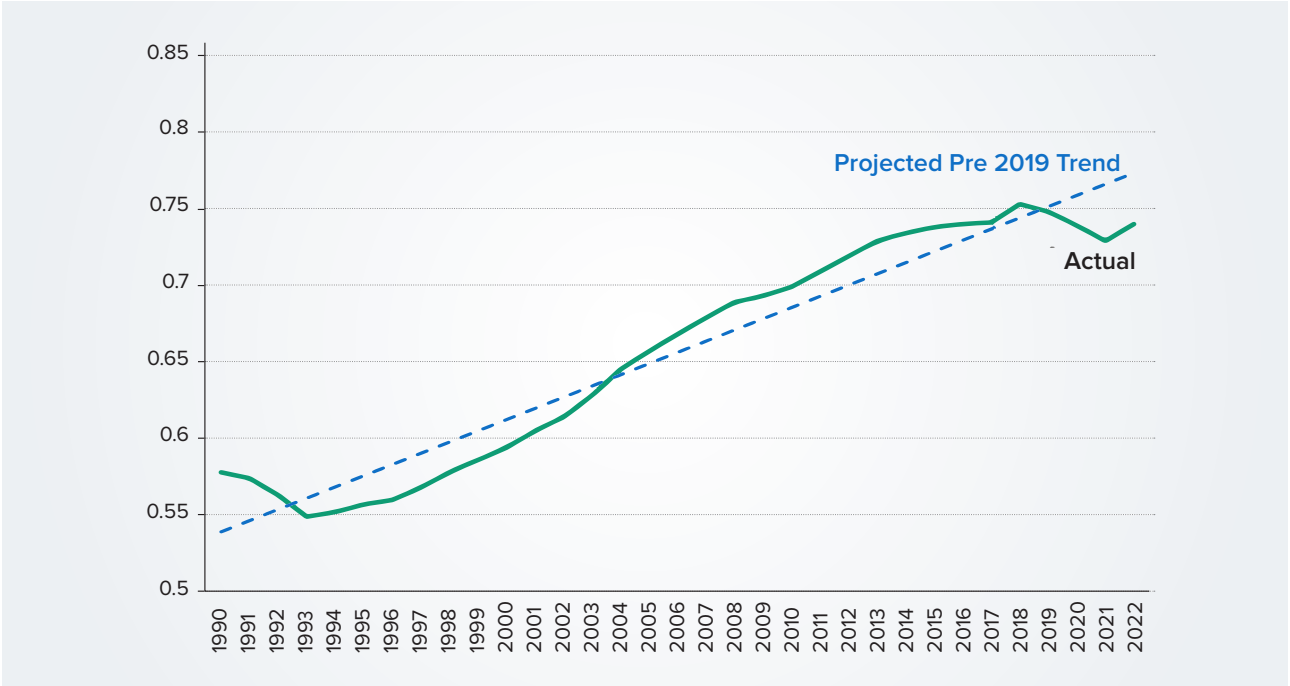
Mongolia is the world's second-largest landlocked country.[11] The total population is around 3.4 million with a density of only 2.2 people per sq km. Around half the population live in the capital, Ulaanbaatar.[12] The population is growing by roughly 1.9 percent annually.[13]

Until recent years, Mongolia was moving forward in human development. Progress can in part be measured using the human development index (HDI), which is a composite measure of income, life expectancy and educational achievement. Mongolia's human development index showed overall progress until 2019 with promising achievements in health, education, and income.[14, 15]

From 1990 to 2022, the HDI value rose from 0.579 to 0.741, a 28 percent increase. This reflected impressive increases in Gross National Income (GNI) per capita of 127 percent; a 13.9-year rise in life expectancy, and a 0.9-year increase in mean years of schooling.

However, as indicated in Figure 1-1, in recent years progress faltered. The HDI had risen steadily until 2018 but started to decline and during the pandemic fell back to its 2013 level. By 2022 it had still not recovered to its 2016 level.[16]

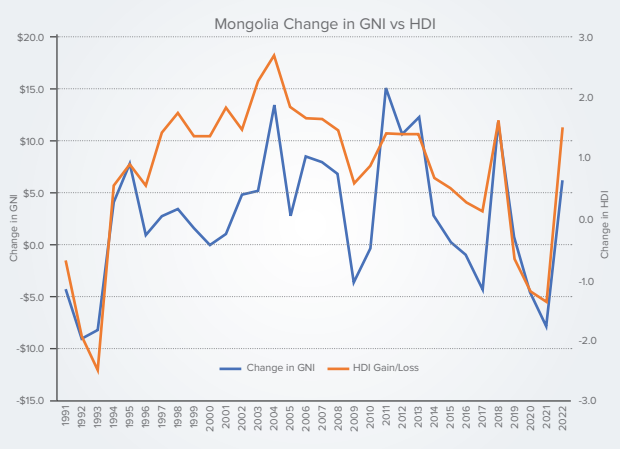
Figure 1-1 Mongolia's human development index, 1990–2022



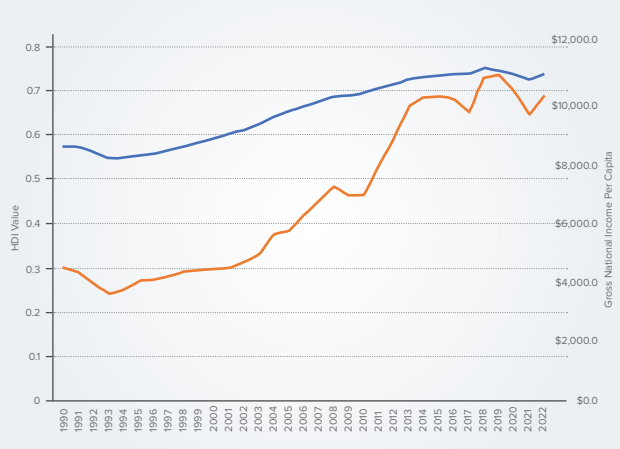
Source: Human Development Report Data Centre

Figure 1-2 Trends in HDI, GNI per capita, life expectancy at birth and mean years of schooling

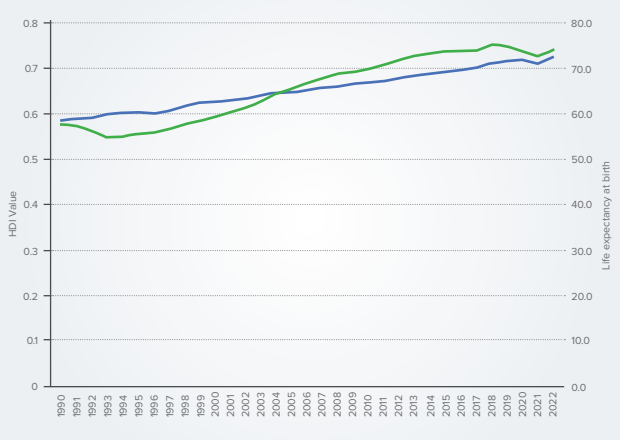
Growth of HDI and GNI



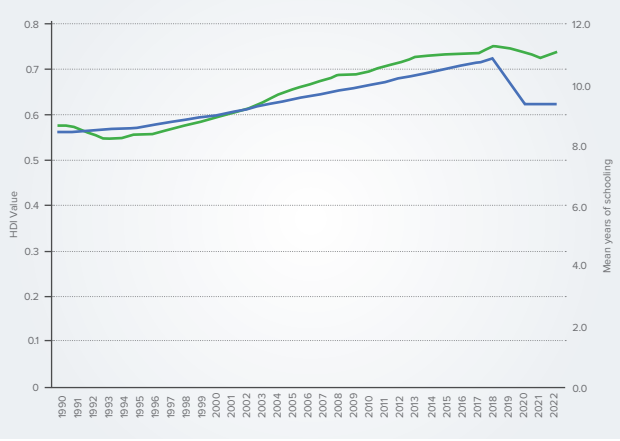
HDI and GNI per capita



HDI and life expectancy at birth



HDI and mean years of schooling



Source: Human Development Report Data Centre

Mongolia's HDI of 0.741 in 2022, placed it at 96 out of 193 countries and in the category of high human development. Nevertheless, in 2021 this was still one of the lowest HDIs in the region, 0.739 compared with the 0.749 average for the East Asia and the Pacific region and lower than the average for the neighbouring Europe and Central Asia region.[17] In addition, its development paradigm is fragile and heavily dependent on natural resources and as a result HDI growth has fluctuated with GNI growth (Figure 1-2 and Annex Table 1).

The decline in recent years also reflects changes in life expectancy at birth and mean years of schooling with fluctuations in educational attainment. Generally, a child beginning their education in Mongolia is expected to complete approximately 15 years of schooling by the time they finish their basic education.[18] However, a significant number do not reach this milestone, as reflected in the data on 'mean years of schooling.' In 2021, the average was only 9.4 years of formal education, indicating a mismatch between the expectations of the younger generation and their actual educational attainment.[19] Some insight from this disparity comes from the 2021 Analysis for Global Learning and Equity which shows striking differences between school entrance and dropout rates of children from households in the poorest quintiles.[20]

Table 1-1 Human development indicators, 1990–2022[21]

Year	Life expectancy at birth	Expected years of schooling	Means years of schooling	GNI per capita	HDI value
1990	58.8	10.2	8.5	$4,504	0.579
1995	60.6	7.7	8.6	$4,144	0.560
2000	62.9	9.4	9.0	$4,569	0.598
2005	64.9	12.7	9.5	$5,894	0.658
2010	67.2	14.6	10.0	$6,957	0.701
2015	69.5	14.8	9.7	$10,240	0.732
2020	72.1	15.0	9.4	$10,627	0.745
2021	71.0	15.0	9.4	$10,588	0.739
2022	72.7	14.5	9.4	$10,351	0.741

Data Source: Human Development Report Data Centre

The world around Mongolia has changed. Over the last 30 years, most of the emerging economies of the 1990s in the region graduated to upper-middle-income (UMIC) status. Mongolia, however, progressed only from low income to lower-middle income, and has just attained the UMIC status in 2024 (Figure 1-3 and Figure 1-4).

Figure 1-3 The world by income, 1992

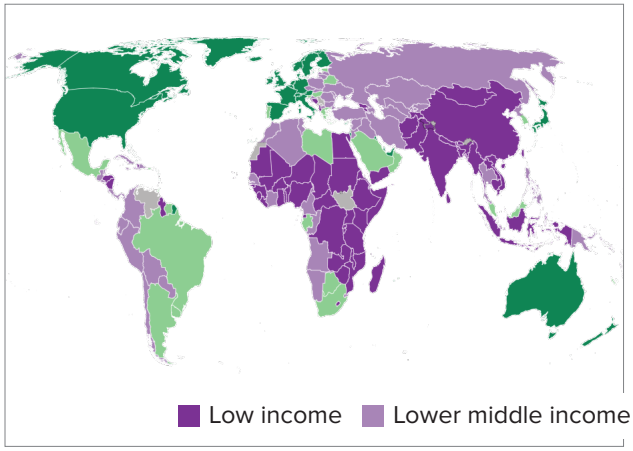
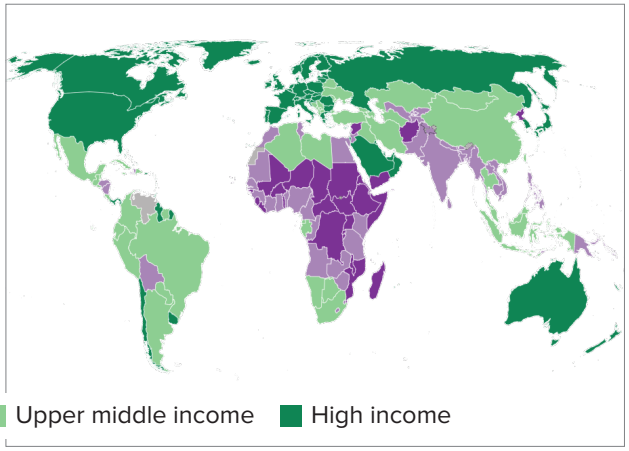


Figure 1-4 The world by income, 2022



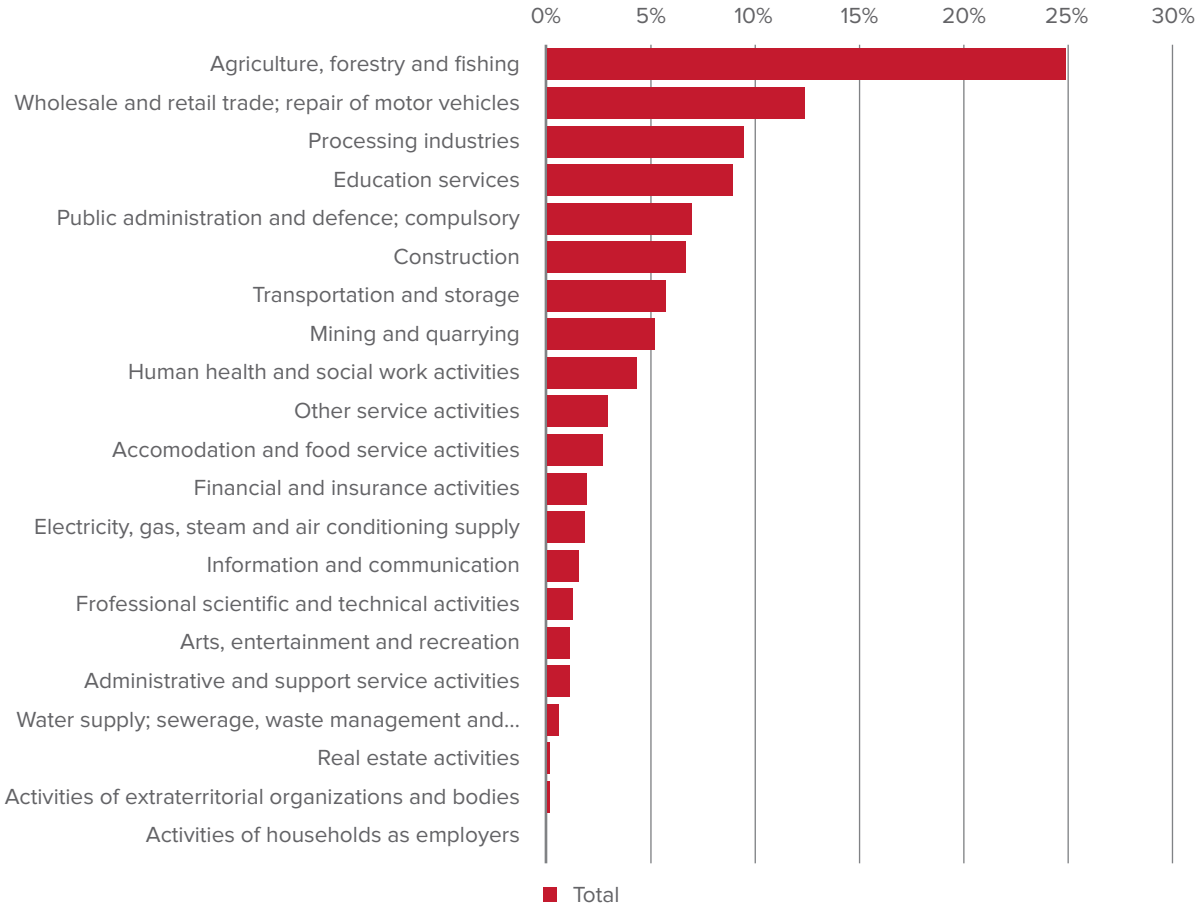
Source: The World Bank WDI 2023

Economic growth and employment

Human development progress has partly been enabled through economic growth. Between 2009 and 2023, Mongolia's GDP per capita rose from $1,759 to $6,008 at current prices.[22] In 2023, the economy registered impressive real GDP growth of 7.4 percent. Between 2009 and 2023, the overall unemployment rate declined from 11.6 to 5.4 percent, with a relatively faster decline in urban areas.[23]

Mongolia's strong economic growth over recent decades has created more jobs, though the majority are in low-paying sectors. Around half of the employed population work in the service sector, 25 percent in agriculture, and 22 percent in the production sector (Figure 1-5) – and only 5 percent in mining (7 percent of men and 2 percent of women).

Figure 1-5 Employment by sector, 2022



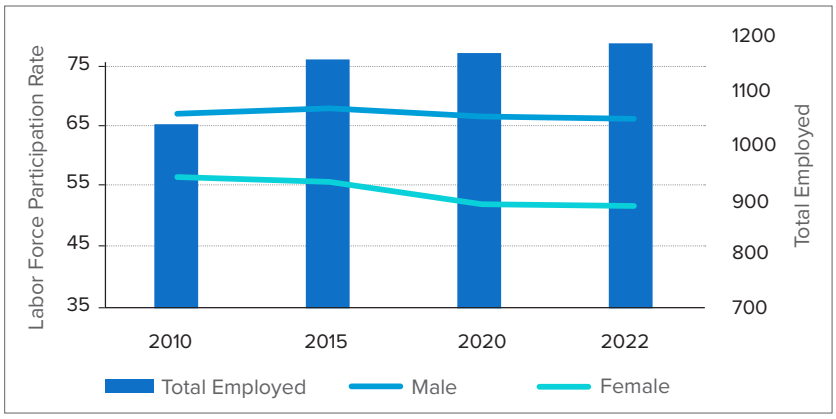
Source: NSO 2023

Women's limited employment

In 2022, women's labour force participation was only 52 percent, compared to men at 66 percent.[24] And even though women tend to have better education rates than men they only occupy 43 percent of managerial positions, and they face a gender wage gap of 6.7 percent. Women's employment is limited by social norms and lack of accessible childcare services.[25]

Between 2010 and 2022, the overall labour force participation rate declined from 62 to 55 percent, and most of this decline was for women, whose participation rate fell from 56.2 to 55.1 percent.[26]

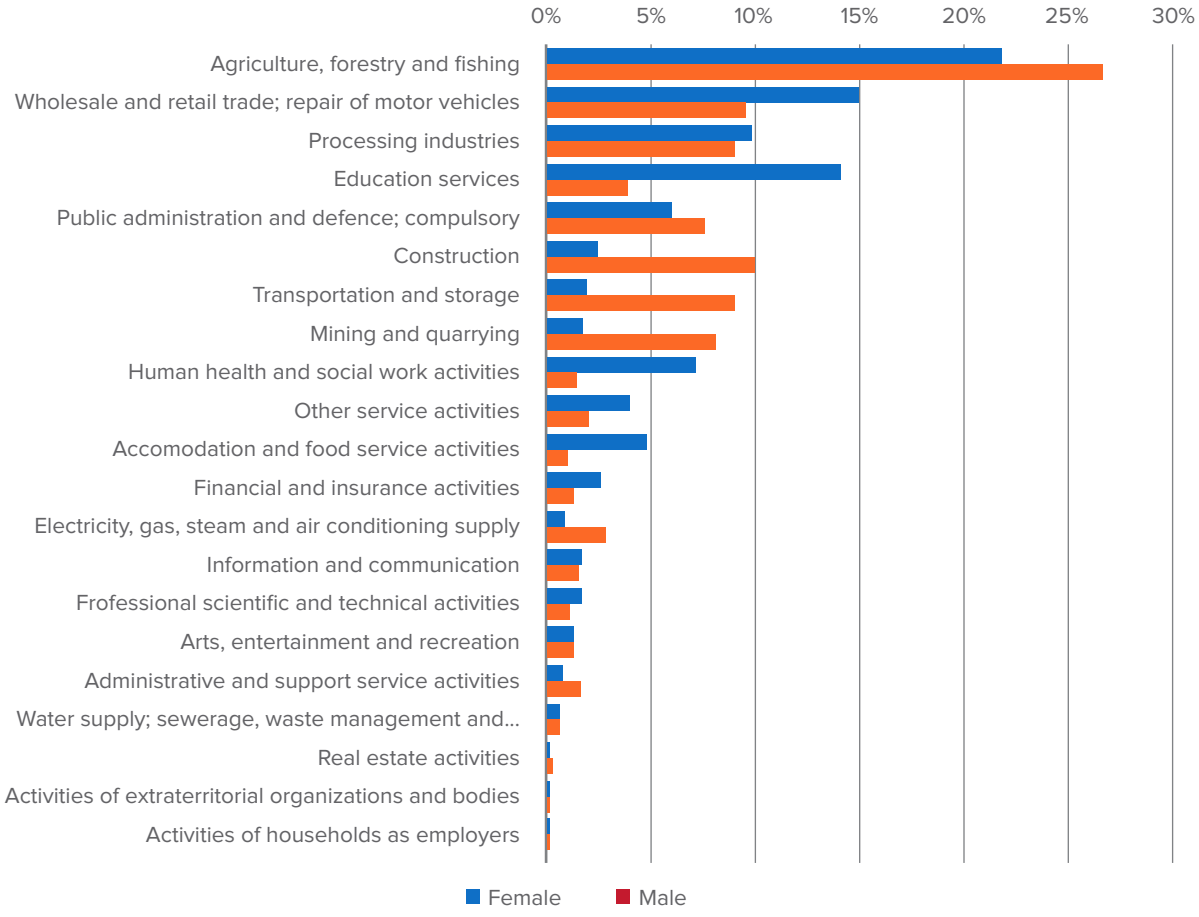
Figure 1-6 Labour force participation rates, and number of employed persons, 2010 to 2022



Data source:
NSO Labour Force Survey 2020

However, there have been changes in the employment of women within sectors. Between 2010 and 2022, the share of female employment increased in several sectors including processing, services, education, health, and professional scientific jobs, while the share of male employees increased in electricity and gas, mining, processing, and construction.[27] Besides agriculture, wholesale and retail trade, processing industry, education, health, and services provide more employment for women than men, though their labour force absorption capacity is relatively limited. (Figure 1-7).

Figure 1-7 Female and male employment by sector



Data source: National Statistical Office 2023

Women are less likely to be in the labour force because of unpaid domestic and care demands. But they are also hampered by gender stereotyping, gender segregation in higher-paid occupations, and the early female retirement age. Increasing the female labour force participation rate would boost Mongolia's annual per capita growth.[28]

The herding tradition

Mongolia's economic landscape is dominated by deep-rooted agricultural traditions and nomadic societies. In 2023, agriculture contributed around 10 percent of value added and absorbed over 22 percent of the labour force.[29] Additionally, the agricultural sector acts as a safety net, providing livelihoods for a large portion of the rural population and plays a crucial role in ensuring food security and reducing poverty.[30]

Agriculture is dominated by livestock husbandry. Around 64.7 million animals in 2023, including sheep, goats, cattle, horses, and camels are reared across the vast Mongolian steppes. These animals not only contribute directly to the economy through meat, wool, and dairy production but also support vital industries such as the production of leather and cashmere.[31]

In 2020, approximately 61 percent of Mongolia's rural households relied on pastoral and animal husbandry activities as their primary source of livelihood.[32] The average annual income of a herding household is estimated at around $5,000, which is on par with the national average, but their incomes depend on the types of animals a family keeps and their proximity to urban centres. Herders who live far from population centres can lose profit to middlemen who buy their animals and animal products.[33]

Mongolia's dairy sector presents a paradox. Despite having one of the highest livestock per capita ratios in the world – 67 million livestock compared to a human population of 3.4 million – the country remains a net importer of milk.[34] This is due to Mongolia's topography and the immense distances between collection points and processing facilities. Herders find it difficult to get to collection points on time, which leads to waste and further financial strain. In 2018, only 10 percent of the 892 million litres of raw cow and sheep milk was processed through dairy factories. On average, earnings from the sale of milk constitute one-third of the income for herder households. When they are unable to sell their milk, many resort to selling their livestock as they lack alternative sources of cash.[35] [36]

Herding communities are also beset by environmental challenges.[37] Herders are facing intensification of a weather phenomenon known as 'dzud', characterized by unusually dry summers followed by extremely cold winters. The dry summers make it difficult to grow and harvest grass as livestock fodder. During harsh winters, the livestock have less fodder, leading to a widespread loss of life for animals and consequently a loss of livelihood for herders. Most herders are not yet following modern animal farming practices.[38]

Another critical issue is financial instability. The absence of state support, especially following the fall of communism in 1990, has left herders to fend for themselves.[39] As of 2019, many herders were in debt.[40] More recently, In 2024, 11.5 percent of animals were lost to dzud weather,[41] which pushed more small-scale herders into a debt and poverty trap.[42] Recently, the government has introduced a herders cooperative programme and a scheme of soft loans for members of the cooperatives.[43]

In the past, the culmination of these challenges has led herders to migrate to urban centres, particularly to Ulaanbaatar. While some do so in search of better educational opportunities for their children, many are forced to move due to the loss of their livestock and livelihoods.

Industrialization through mining

Mining, whether for coal or for metal ores, is another major part of Mongolia's economy. In 2023 when GDP grew by 7.4 percent, the mining sector provided 30 percent of the added value.[44] Mining and quarrying account for over 90 percent of exports and for 74 percent of foreign direct investment.[45] However mining creates relatively few jobs and absorbs only 5 percent of Mongolia's labour force. Capital expenditure budgets for major mining projects, such as the Tolgoi copper/gold mine and the Tavan Tolgoi coal deposit, are at a similar level to Mongolia's total GDP.

Large-scale migration

There is also a clear urban-rural divide.[46] In 2022, Ulaanbaatar, the capital, housed 45 percent of the workforce; the remaining 55 percent were dispersed across vast rural expanses.[47] This disparity is further accentuated by differing levels of unemployment. In 2022, the highest level was 15 percent in Govi Altai province, followed by 13 percent in Bayankhongor, 12 percent in Zavkhan, and 11 percent in Baganuur, BagaKhangai and Khovsgul, and in Bayan-Ulgii.[48]

In 1992, following its transition from a soviet society to a multiparty democracy and a free market economy, Mongolians regained freedom of movement. This enabled a high volume of internal migration as rural people sought better livelihoods. Over the past three decades, around 20 percent of Mongolia's population moved to Ulaanbaatar.[49] In addition, one out of 11 Mongolians is living abroad, of whom 65 percent migrated for economic reasons.[50] Other contributing factors to this migration include climate change-induced natural disasters, livestock loss, and a growing infrastructure gap between urban and rural areas.[51] Further labour market challenges include slow capital deepening, an aging labour force, and many job and skills mismatches.[52]

Initially, migrants moved to the Central Region before ultimately settling in Ulaanbaatar, which now houses over 1.6 million people – 48 percent of the country's population. Annually, over 60,000 people migrate to the city, often bypassing intermediary options like soum or aimag centres. This massive influx has led to environmental degradation, unsustainable resource management, and severe pollution, including heavy air pollution.[53]

Upon arrival in Ulaanbaatar, migrants face a host of challenges. While the Law on Land of 1992 granted all Mongolian citizens the right to own a piece of urban land, migrants face discrimination in various forms, including limited access to basic amenities and services. Most migrants reside in ger districts not connected to the city's infrastructure or the centralized heating supply. They are left to manage their own pit latrines and draw clean water from local water kiosks, transporting it home by hand or on small carts, or vehicles.[54]

Moreover, since 2017, attempts to restrict and even ban migration to Ulaanbaatar have increased the vulnerability of migrants as they can no longer register as city residents for access to local services.[55] While living in the city's suburbs, they are compelled to burn alternative fuels for survival, and are then unjustly stigmatized as the primary culprits behind the city's deteriorating air quality. This blaming exacerbates their vulnerability even though the root cause of the pollution is systemic poverty and a lack of urban infrastructure.[56]

The challenges faced by vulnerable communities

Economically, the population outside Ulaanbaatar is concentrated in specific industries and nomadic herding across four regions, particularly in mining towns, which limits their economic mobility and makes them vulnerable to industry-specific downturns.

The economic challenges confronting vulnerable communities across Mongolia are intensified by the weakness of the economies at regional and aimag level. Far from Ulaanbaatar, these provinces have less than adequate infrastructure, limited urbanization, and a heavy dependence on pastoral herding and agriculture which is highly susceptible to climate change and market fluctuations.[57]

With limited job opportunities in their native regions, the populations from aimags continue moving to the capital city.[58] In Ulaanbaatar, they form communities to support each other and preserve their cultural identity. But this also leads to economic vulnerabilities, as they may lack diversified income streams and become overly reliant on community networks for economic survival.[59]

BOX 1-3 PM, SO_2, and NOx emissions from burning fossil fuels

- **Fine particulate matter and respiratory health** – The concentration of fine particles, specifically PM2.5, is a primary metric for gauging air pollution and its subsequent health impacts. PM2.5 particles can deeply penetrate the lungs and are strongly associated with various health issues. The World Health Organization (WHO) has set the guideline for PM2.5 at 10 µg/m^3 for the annual mean. In Ulaanbaatar, there have been instances where air pollution levels reached 3,320 µg/m^3, which is 133 times the WHO guideline for the 24-hour mean concentration.[60] Even after the 2022 ban on burning raw coal, the average national PM2.5 exposure level was 60 µg/m^3 which is six times higher than the WHO recommended levels.[61] Over time, this exposure can culminate in respiratory diseases, including chronic bronchitis and emphysema. Moreover, there is a clear correlation between PM2.5 exposure and premature deaths stemming from cardiovascular and respiratory illnesses.[62]

- **Sulphur dioxide and cardiovascular consequences** – Sulphur dioxide (SO_2) is a significant air pollutant, primarily released from the burning of fossil fuels. When inhaled, SO_2 can cause a range of adverse cardiovascular effects – reacting with other compounds in the atmosphere to form fine particulate matter, which has been linked to heart attacks, irregular heartbeat, and other cardiovascular complications. It is essential to monitor and regulate SO_2 emissions to protect public health, especially in areas with high industrial activity or where coal is a primary energy source. In Mongolia, acute exposure to ambient air pollution, including SO_2, has been linked to increases in both morbidity and mortality.[63]

- **Nitrogen oxides (NOx) and respiratory implications** – Combined with other atmospheric pollutants, NOx emissions lead to the formation of ground-level ozone, an irritant that can worsen respiratory conditions and compromise lung function. Long-term exposure can result in heightened respiratory symptoms, impaired lung development in children, and aggravation of chronic respiratory ailments. Mongolia has seen a marked increase in NOx concentrations, especially in Ulaanbaatar.[64]

Dangerous air pollution

Air pollution has been a long-standing issue, particularly in Ulaanbaatar. The city's unique conditions, including its status as the world's coldest capital, and reliance on coal-powered heating and the use of coal briquettes by households in the suburbs to stay warm, make Ulaanbaatar one of the world's most air-polluted cities.[65] [66] Further, most of the raw coal used in ger area households is of low quality, containing elevated levels of contaminants such as sulphur, ash, volatile organics, and moisture, and has low energy content. The burning of coal by both ger and housing dwellers is responsible for more than 80 percent of air pollution in winter, with the rest attributed to the operation of coal-powered combined heating and power systems and the transport sector.

Air pollution in Mongolia poses severe health risks, with pregnant mothers and foetuses being critically vulnerable. During the first six months of pregnancy, exposure to high levels of PM10 and PM2.5 increases the risk of hypertension. Between the fourth and sixth months, exposure to nitrogen dioxide and sulphur dioxide has been associated with diabetes. Alarmingly, prenatal deaths are 3.5 times more common in winter than in summer.[67]

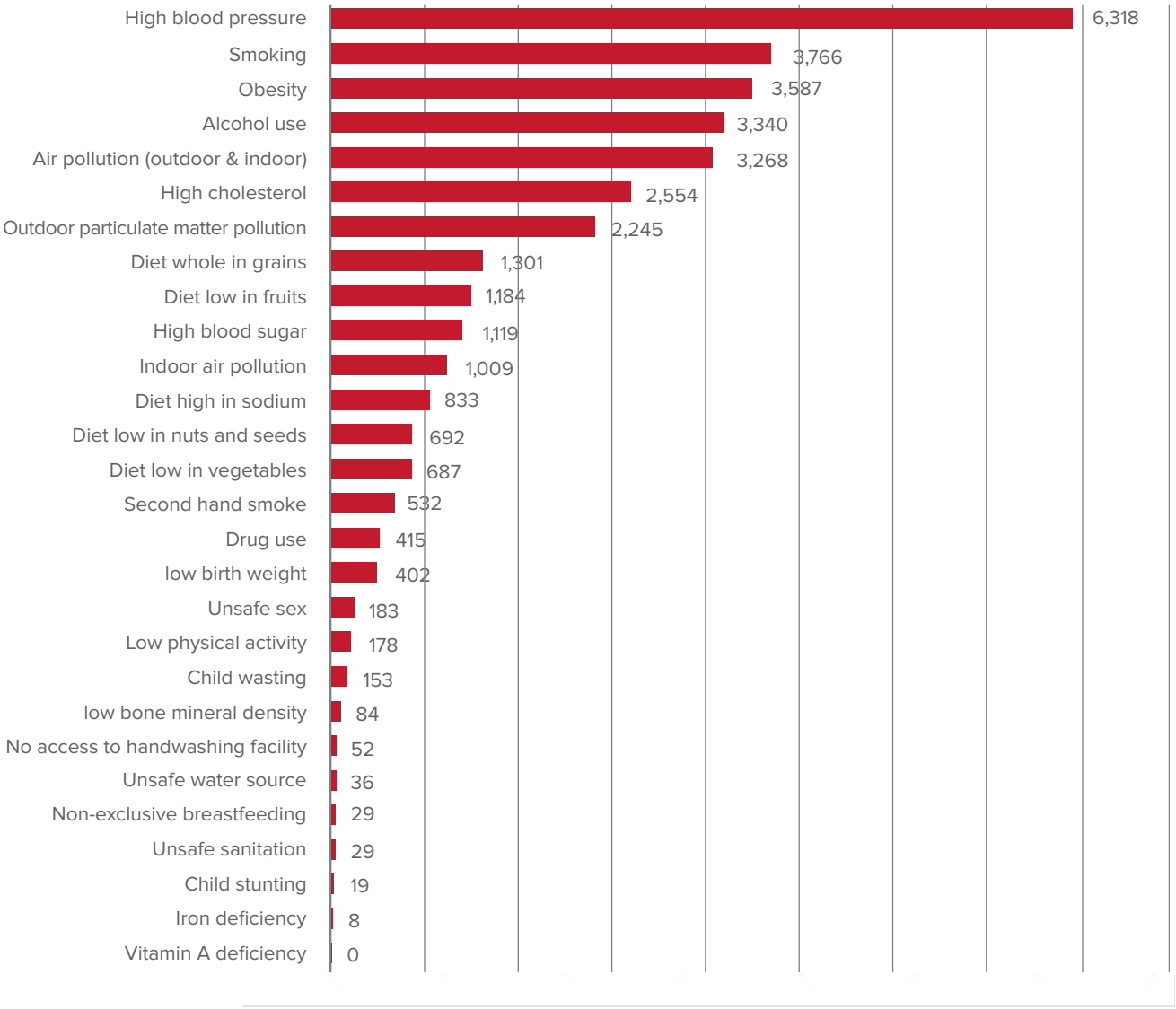
Health impact of pollution

Emissions from burning fossil fuels contain PM, SO_2, and NOx, each with its own set of health implications (Box 1-3).[68] This exacerbates public health issues related to smog in winter.

Children bear the brunt of the city's polluted air. Those residing close to a pollution source have a 40 percent reduced lung function compared to those in cleaner regions.[69] The statistics are grim: in 2015, 435 children died from pneumonia; and by 2018, one in every five pneumonia deaths was a child under five. Children in Ulaanbaatar are more prone to bronchial inflammation, with rates five to fifteen times higher than their rural counterparts.[70] On most days, indoor PM2.5 has greatly exceeded the WHO recommended guideline levels.[71]

Between 2011 and 2019, respiratory diseases in Ulaanbaatar rose from 903 to 1,961 out of every 10,000 people. Conditions like bronchitis and asthma in children are leading to missed school days and other developmental setbacks. Average CO_2 levels in kindergartens during weekdays are 1.2 to 2.9 times higher than the Mongolian national standard.[72] The rate of child illness is highest in the autumn, resulting in increased absenteeism of children from school and parents from work. Further, the burden of unpaid care work disproportionally falls on women as they are the primary care givers at home and more likely to increase their absentee days to care for sick children.[73]

Figure 1-8 Deaths by risk factor, Mongolia 2019



Data source: IHME, Global Burden of Disease (2019) Via our World in Data

By 2020, 39 percent of all reported respiratory diseases were in children aged 0-5 years. High PM2.5 concentration in the air is linked to a 33 percent increase in the mortality rate of children due to respiratory diseases.[74] For adults aged 15-49, the mortality rate was 23 deaths per 100,000 people, while those aged 50-69 faced a significantly higher rate of 218 deaths per 100,000. For older adults often having pre-existing health conditions, the added burden of poor air quality can exacerbate health complications, leading to increased mortality.[75]

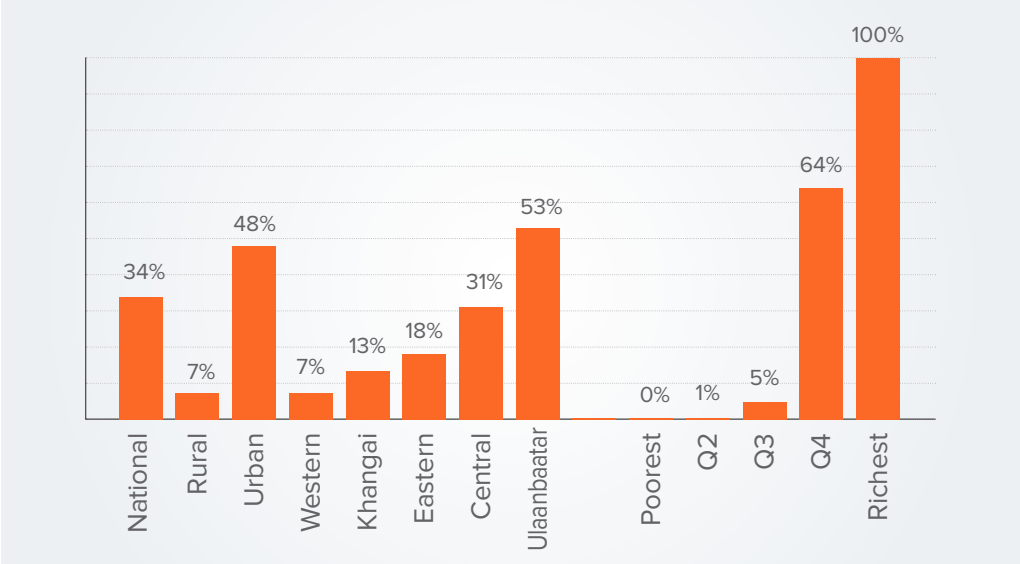
This affects public health and life expectancy, which is a core HDI component. Air pollution and outdoor particulate matter remain the fifth and seventh largest causes of death respectively in Mongolia. Indoor and outdoor air pollution are among the top five causes of risks in Mongolia (Figure 1-8).

Economic costs of air pollution

The long-run impact of air pollution on cognitive abilities and learning and educational outcomes cannot be understated. These impacts translate into lower productivity.[76] In 2022, the economic cost-of-illness attributed to ambient air pollution in Mongolia amounted to $1.15 billion. Stroke bore the highest share, followed by ischemic heart disease, acute lower respiratory illness, lung cancer, chronic obstructive pulmonary disease, and diabetes. These estimated costs encompass health-care expenses, productivity losses from presenteeism, absenteeism, and premature mortality. On average, the cost per death was $386,980, with acute lower respiratory illness accounting for the largest proportion, followed by diabetes and stroke. This economic burden represents 8 percent of national GDP.[77] Delving deeper into these figures, health care costs make up 0.25 percent of the total economic burden, translating to $2.62 million. Meanwhile, workplace productivity losses account for 0.51 percent, equivalent to $5.35 million.[78]

The long-term consequences are equally grim: children exposed to high levels of pollution are likely to suffer from permanent lung damage, which could significantly reduce their future earning potential. Additionally, frequent school closures due to elevated pollution levels hamper their educational progress.[79] This educational disruption not only affects immediate wellbeing but also diminishes future earning capacity, thereby reinforcing the cycle of poverty. Energy poverty exacerbates economic poverty, which in turn perpetuates a cycle of intergenerational poverty and injustice. Children born into these disadvantaged conditions are likely to remain there.[80] [81]

Figure 1-9 Access to clean fuels for cooking, heating and lighting



Source: MICS 2022

To address the severe air pollution levels in Ulaanbaatar, in 2019 the Government imposed a ban on raw coal use and mandated highly subsidized refined coal briquettes. But with a quarter of Ulaanbaatar's population below the national poverty line,[82] these briquettes remained financially out of reach for many. Consequently, some resorted to alternatives like burning rubber. Before the ban, there were 33 fatal and 151 non-fatal carbon monoxide poisonings. Alarmingly, post-ban, these numbers surged to 91 fatal and 1,633 non-fatal poisonings.[83] The increased costs of briquettes, inadvertently exacerbated the financial burdens on Ulaanbaatar's most vulnerable residents.[84]

Inadequate housing

Mongolia has 897,000 household dwellings. Of these, 61 percent are houses or other buildings, while 38 percent are traditional gers – made from wooden lattices and poles covered in layers of felt made from animal hides, and sometimes further layers of canvas.[85] Mongolia has severe winters that span an average of six months, with temperatures often plummeting to -40 degrees Celsius.

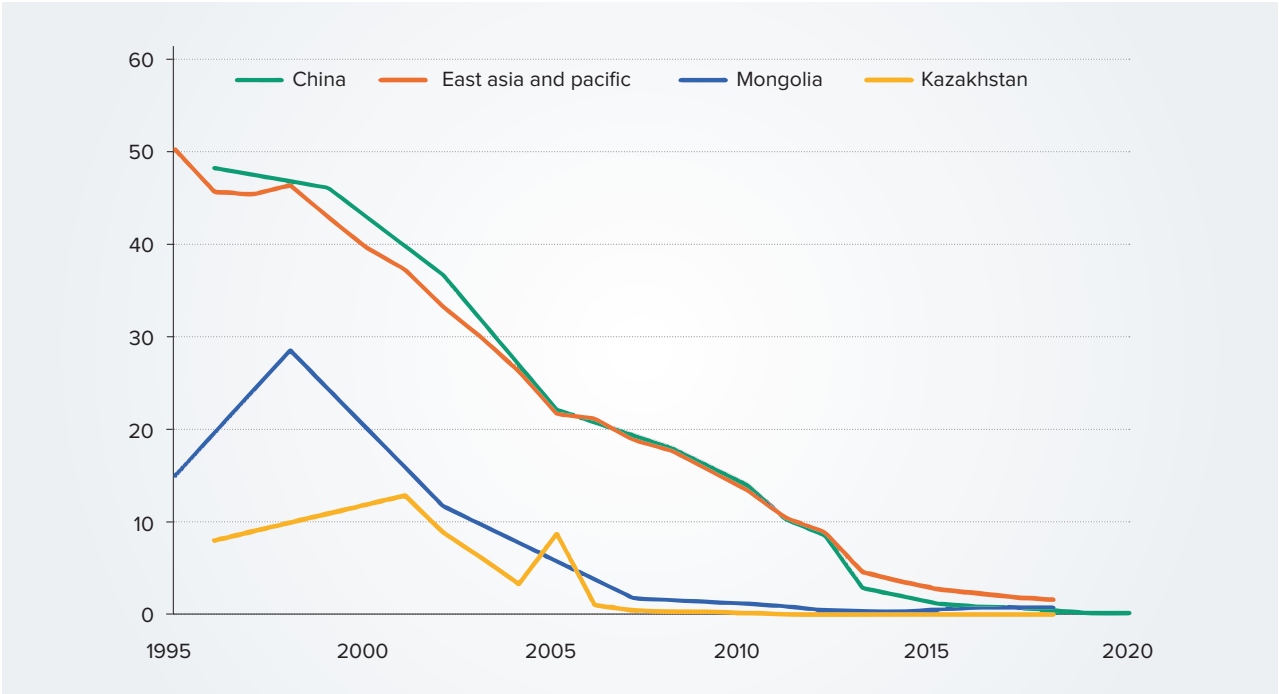
Many impoverished people live in dwellings with poor thermal insulation, requiring more energy to maintain a livable temperature. Households living in gers use traditional coal stoves for heating in winter, and for cooking throughout. As a result, families in these districts allocate between 25 and 40 percent of their income solely for fuel. On average, poor households devote 18 percent of their monthly non-food consumption to heating and utilities while the non-poor devote only 10 percent.[86]

Moreover, the electricity supply in these areas is inconsistent and of low quality, with many residents resorting to illegal connections to meet their energy needs.[87]

Poverty and inequality

The gains in HDI in earlier decades were accompanied by unprecedented declines in poverty and inequality (Figure 1-10). During the economic boom of 2010–2014, the headcount poverty ratio, the proportion of people living in extreme poverty, fell by 0.5 percent for each 1 percentage point increase in GDP growth. However, between 2016 to 2018, despite an average annual growth rate of 4.4 percent, poverty fell only slightly. This was because most of Mongolia's growth came from the mining sector which creates relatively few jobs, so the fruits of growth were unevenly distributed.[88]

Figure 1-10 Share of population living in extreme poverty 1995 to 2020



Source: Our World in Data - Poverty is defined as living below the international poverty line of $2.15 per day

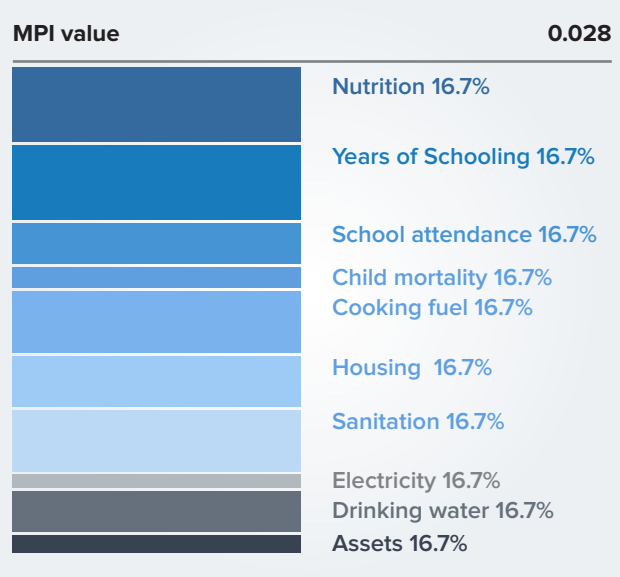
Poverty can also be assessed using the national poverty line, which is set at $66 in 2018 dollars. Despite a sharp rise in GDP per capita, the percentage of individuals living below this line was 22 percent in 2014, increasing to 30 percent in 2016, through falling back in 2020 to 27 percent.[89] Between 2018 and 2022, the rural poverty rate was largely unchanged at 35 percent, while the urban rate fell from 27 to 23 percent – thus widening the rural-urban poverty divide.

Poverty is multidimensional

People can thus be deprived in many other aspects of their lives beyond income. To reflect this, a broader measure of poverty is the multidimensional poverty index (MPI), which measures deprivation along ten indicators, covering income, education, and basic infrastructure services. If a person is deprived in a third or more of ten MPI indicators, they are characterized as, 'multidimensionally poor'.[90] In 2018, 7.3 percent of the population (256,000 people) were multidimensionally poor while a further 15.5 percent were classified as vulnerable.[91] Overall, 39 percent of the population were living in some form of poverty.

A country's MPI is arrived at by multiplying the headcount ratio by the intensity of poverty.[92]

Figure 1-11
Multidimensional poverty and its components



Source: HDRO, MPI 2023

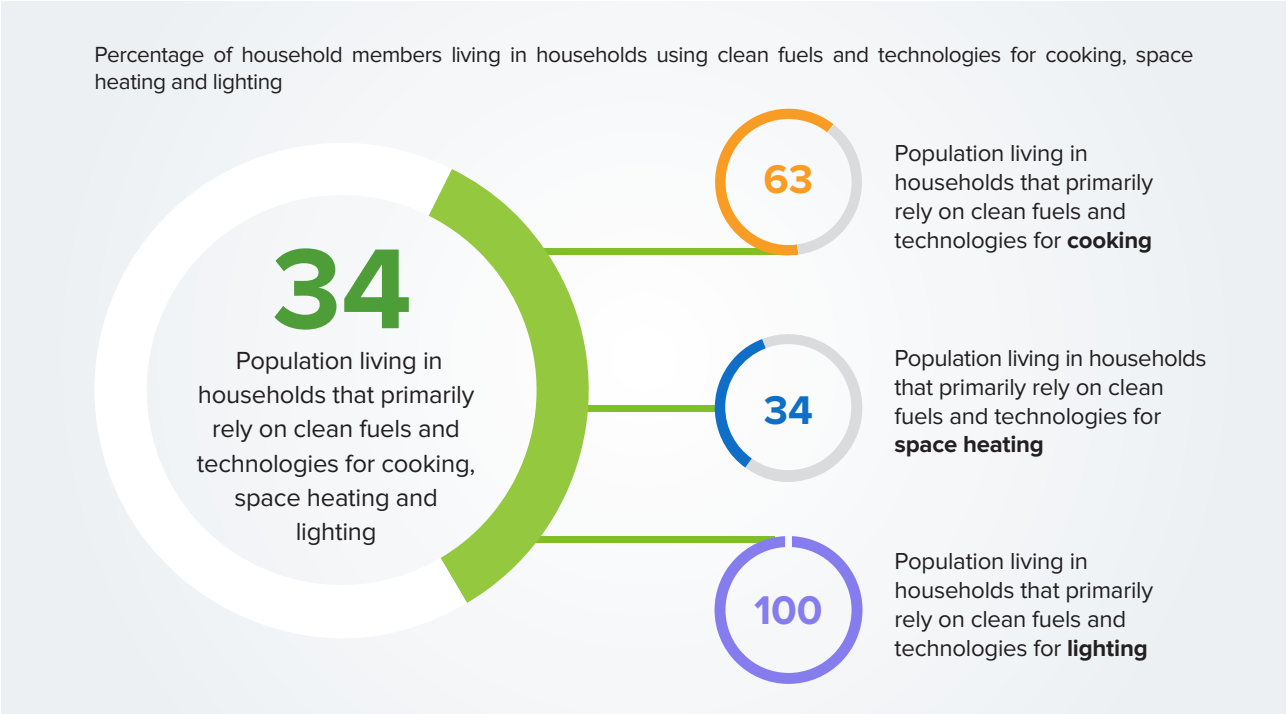
Mongolia's MPI of 0.028 (2018) is higher than those of Kyrgyzstan and Turkmenistan, both at 0.001.[93]

Greater detail of the scale of poverty can be seen from the MPI's component indicators (Figure 1-11). The greatest deprivation is for years of schooling and for nutrition.[94] Around 12 percent live in sub-par housing conditions. However, less than 2 percent lack essential assets for living.[95]

In Mongolia, 99 percent of households have electricity.[96] Nevertheless, according to UNICEF, approximately 47 percent of the population does not have access to clean cooking fuels (Figure 1-12).[97] Without a clean energy transition by 2030, around one-third of the population would still rely on inefficient and hazardous cooking fuels and technologies.[98]

These disparities are even starker given the rural-urban and geo-spatial divides. Only 7 percent of the population in rural areas have access to clean fuels. Around 60 percent of the population is considered vulnerable in terms of access to clean energy. Among the middle-income group, only 64 percent have access to clean fuels. Ulaanbaatar is the only metropolis, where 53 percent have access (better than the national average of 34 percent); the proportion in other cities is far lower. The Western region has the poorest access (at 7 percent) followed by Khangai (13 percent), Eastern region (18 percent), and Central region (31 percent).[99]

Figure 1-12 **Clean fuel usage**



Source: UNICEF MICS 2021

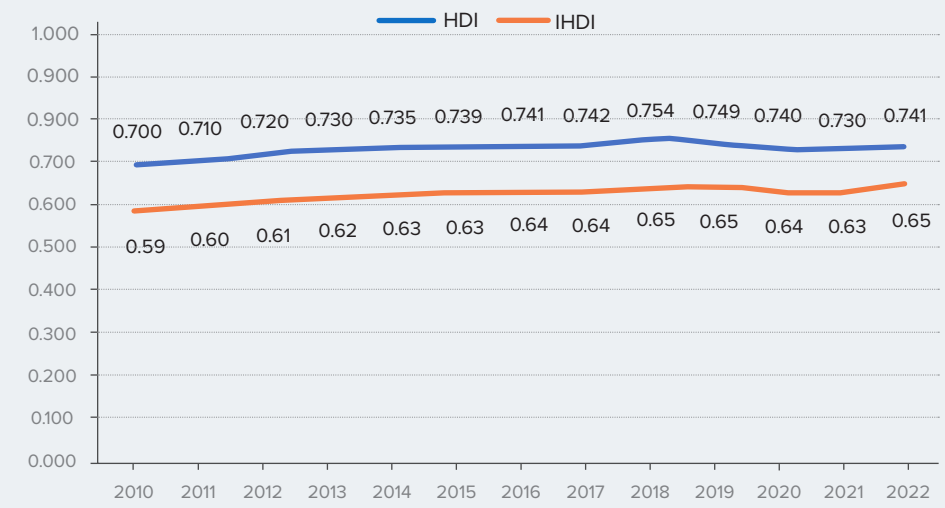
Beginning in 2000, a government and World Bank-funded programme provided herders with solar panels for their gers. By now, the programme has provided electricity to more than 100,000 households, including 70 percent of herders, transforming their lives.[100]

However, rural areas have seen less progress in other social infrastructure or in industry – lacking reliable and uninterrupted access to electricity, telecommunications, internet, and digital services.[101] Not long ago, schools in rural areas did not have enough protection from cold winds during extreme cold weather, and floors were freezing cold.[102] Similarly, the absence of high-speed internet and devices pose significant barriers to the education of low-income children in rural areas as well as in the suburbs of the capital city.[103]

Widespread disparities

Thus, although Mongolia has seen an overall improvement in human development, the benefits have not been distributed equally. To capture some of these imbalances, UNDP has developed the inequality-adjusted HDI (IHDI).

Figure 1-13 HDI and IHDI 2010–2021

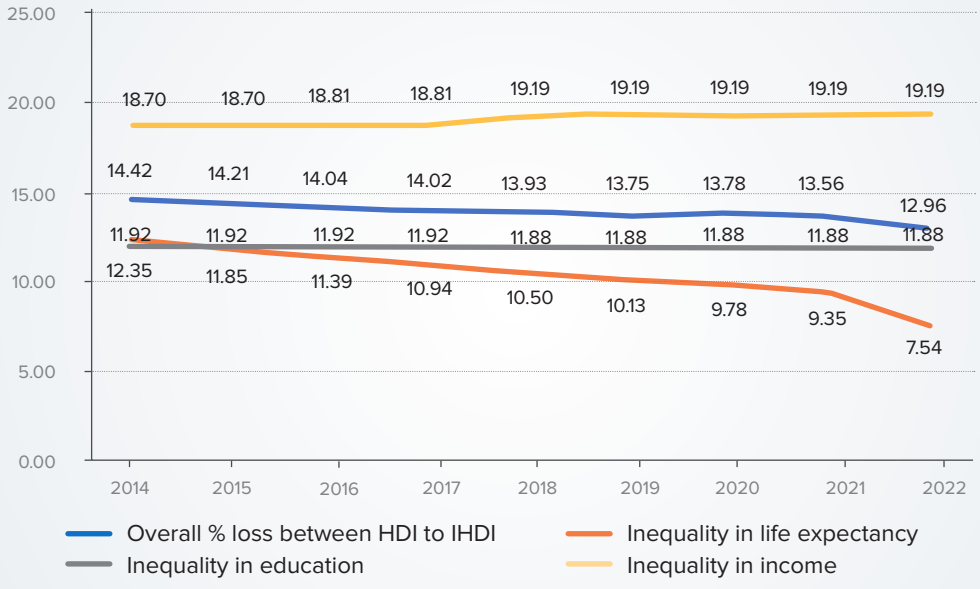


Source: Human Development Index Data Centre

The IHDI discounts the HDI by a factor which reflects inequalities in income, education, and life expectancy.[104] In 2014 in Mongolia, this factor was 13.3 percent and by 2021 was still 12.9 percent (Figure 1-13). This suggests that efforts to address inequality have not led to significant improvements.

Particularly striking is the discount for income inequality. Since 2018, the loss in HDI due to income inequality has been consistently high, at around 16 percent (Table 5-1). Between 2014 and 2021, the discount factor for educational inequality persisted at 12 percent. This is concerning, considering the pivotal role of schooling, and implies that educational reforms and investments are not addressing the root causes of disparities. According to the 2020 national labour force survey, 20 percent of youth aged 15-24, approximately 74,000, were not in education, employment, or training.[105] A significant portion of the population is thus not benefiting from the nation's overall economic progress.

Figure 1-14 Losses resulting from inequality in income, education and life expectancy



Source: Human Development Report Data Centre

The picture is somewhat better for inequalities in health. Between 2014 and 2021, the discount for health inequality fell from 12.4 to 7.5 percent, reflecting improvements in healthcare access or quality across different social strata, although the exact factors require further investigation.

Gender inequalities

There has also been some reduction in gender inequality. One measure of this is the gender development index which is the ratio of the female and male HDIs. In 2022, the female HDI value was 0.751 while for males it was 0.728, resulting in a GDI value of 1.032. This places Mongolia in the high GDI group.[106]

This should be a cause for satisfaction. However, this is a decline from the peak GDI value of 1.045 in 2020 before the impact of the pandemic. The pandemic also saw setbacks in other measures of gender development, such as life expectancy, mean years of schooling, and per capita income.

The gender inequality index (GII) measures gender-based disadvantage across three dimensions: reproductive health, empowerment, and the labour market. In recent years the GII has shown some improvement.

The gender social norms index (GSNI) measures how social beliefs obstruct gender equality in areas like politics, work, and education. Based on the GSNI, 97 percent of people have at least one bias against women's empowerment, showing the need for gender inclusive policies and measures for behavioural change.

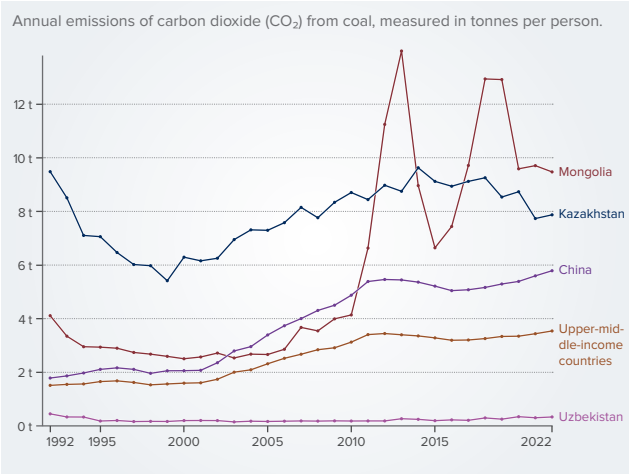
CO_2 emissions and climate change

Mongolia is responsible for only 0.12 percent global emissions, but with 11.2 tons of GHG emissions per person in 2022 (of which 30 percent comes from coal electricity production) it ranks 17th among the world's highest per capita CO_2 emitters.[107] Further, Mongolia's energy-related GHG emissions have increased by 60 percent since 1990.[108]

A forthcoming European Commission-funded UNDP study analyses household emissions data by categorizing them into two distinct groups. The first group, known as the basic set, aligns with the standards set by the Kyoto protocol. This group alone is responsible for releasing 1,344 thousand tons of CO_2 equivalent into the atmosphere every year. However, the second group, termed the extended set, includes additional pollutants such as carbon monoxide, organic carbon, and black carbon. When these are factored in, the annual emissions surge to an even more concerning 2,083 thousand tons of CO_2 equivalent. This significant increase with the inclusion of the extended set which emphasizes the broader environmental repercussions of household air pollution, suggests that its impact goes beyond traditional CO_2 emissions.[109]

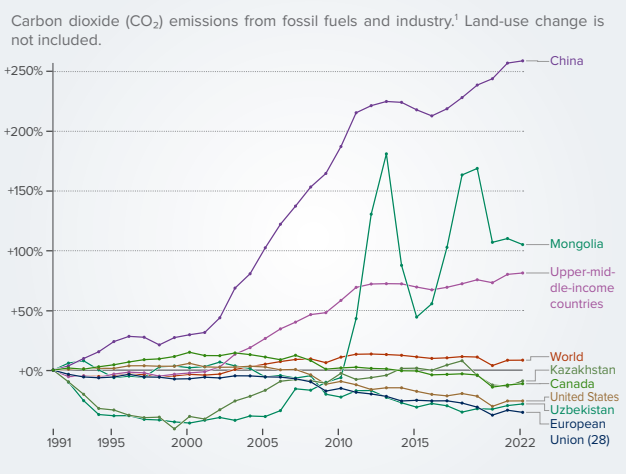
Without major changes, Mongolia's economic development trajectory is not consistent with the Long-Term Low Emission Development Strategies (LT-LEDS) necessary to reach its ambitious Nationally Determined Contribution (NDC). A low carbon future requires accelerated decarbonization of both power and energy systems.

Figure 1-15 Per capita CO_2 emissions from coal



Data source: Our World in Data

Figure 1-16 Change in per capita CO_2 emissions



Data source: Our World in Data

1. Fossil emissions: Fossil emissions measure the quantity of carbon dioxide (CO_2) emitted from the burning of fossil fuels, and directly from industrial processes such as cement and steel production. Fossil CO_2 includes emissions from coal, oil, gas, flaring, cement, steel, and other industrial processes. Fossil emissions do not include land use change, deforestation, soils, or vegetation.

Non-renewable forest loss is estimated at 436 kilo hectares,[110] valued at $1.56 million.[111] This loss is likely tied to the use of other biomass materials as fuel for cooking, heating, and construction. Forests play a crucial role in carbon sequestration and biodiversity and serve as resources for local communities.

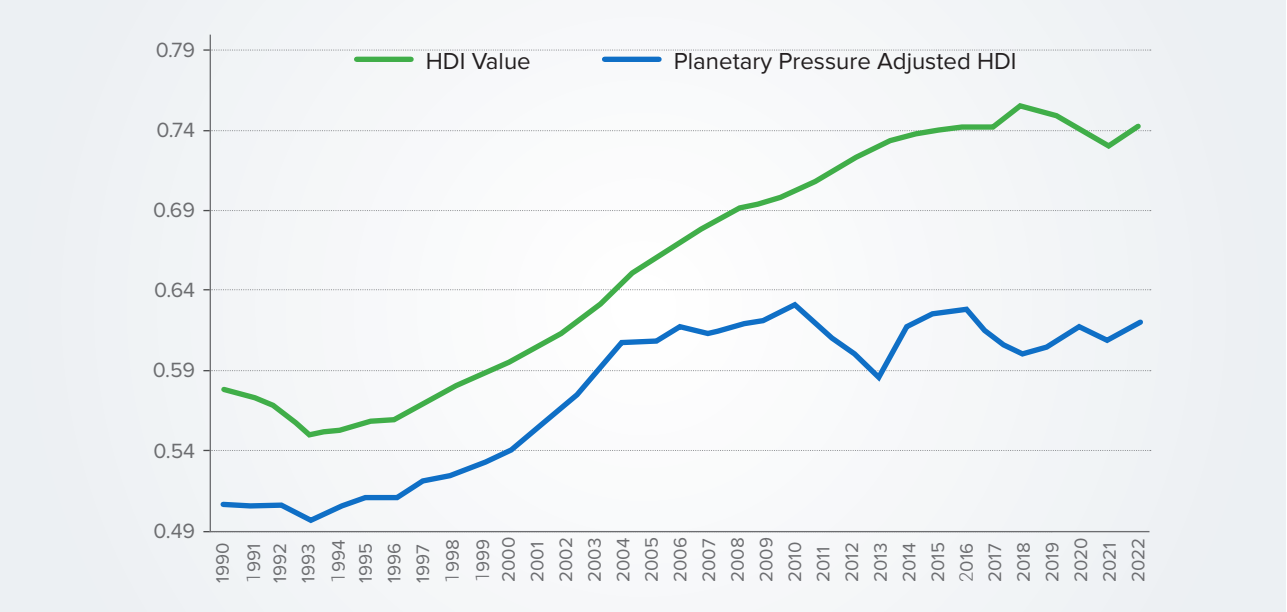
As well as contributing to global warming, Mongolia also experiences the consequences. Between 1940 and 2015, average temperatures rose by more than 2 degrees,[112] which is higher than the global average. Increased frequency of climate change-related disasters, and higher average temperatures (than the global average) are threatening Mongolia's lively herding traditions, tourism, agriculture, and ecosystems. The rise in temperature has made the country increasingly susceptible to climate-related disasters such as droughts, frequent 'dzud' (extreme winter), wildfires, permafrost loss, and water shortages.

The increased frequency and severity of disasters is having a harmful effect on agriculture, livestock, water and land resources, infrastructure, animals, and on the overall wellbeing of the population.[113] Climate change has also degraded Mongolia's peatland and permafrost ecosystems. The loss of these natural carbon sinks would release excessive amounts of CO_2 into the atmosphere, causing higher global temperatures,[114] thus hindering efforts to mitigate climate change and advance human health and development.

The planetary pressures adjusted HDI

To take greater account of environmental degradation, UNDP has developed the planetary pressures adjusted HDI (PHDI) which discounts the HDI based on per capita CO_2 emissions and the country's material footprint.[115] If there were no environmental pressures, the PHDI would match the HDI. As indicated in Figure 1-17, the gap between Mongolia's HDI and PHDI has widened significantly over the past 20 years. In 2022 the PHDI was 16 percent lower than the HDI – thus translating into the highest discount in HDI among neighbouring countries (Table 1-2).

Figure 1-17 Mongolia's HDI and PHDI, 2009–2022



Data Source: Human Development Report Data Centre

Table 1-2 Regional comparison of PHDI

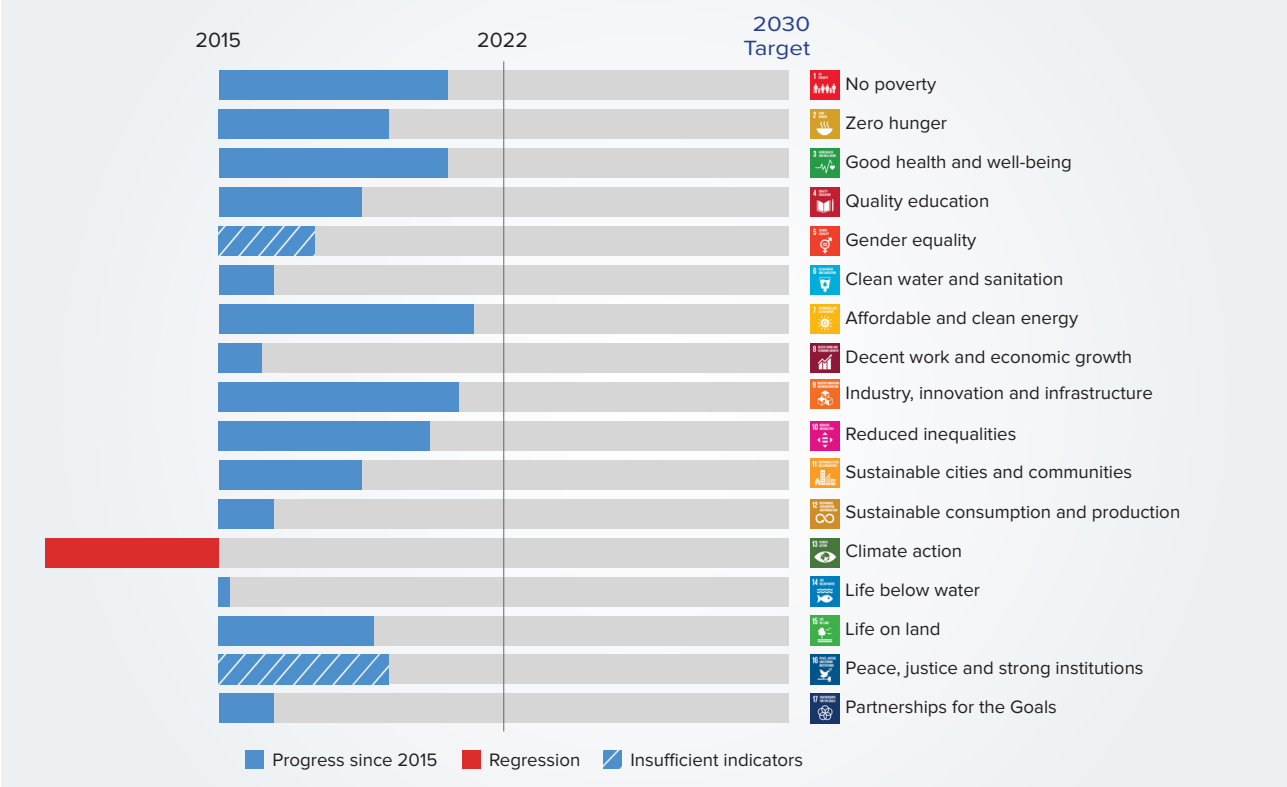
Regions and Countries	HDI 2022	PHDI 2022	Difference from HDI value (%)
Europe and Central Asia	0.802	0.743	-7.4
High human development	0.764	0.691	-9.6
East Asia and the Pacific	0.766	0.683	-10.8
Mongolia	0.741	0.619	-16.6
Kazakhstan	0.802	0.688	-14.2
China	0.788	0.679	-13.8
Turkmenistan	0.744	0.662	-11.0
Uzbekistan	0.727	0.696	-4.3
Nepal	0.601	0.581	-3.3

Data Source: Human Development Report Data Centre

SDG progress

Across Asia and the Pacific, for most SDGs there has been only modest progress while for climate adaptation and mitigation action there has been regression (Figure 1-18). In Mongolia, out of the 83 measurable SDG indicators, only 32 are on track to meet their targets by 2030. To achieve its SDG targets, the country would require $44 billion in additional spending.[116]

Figure 1-18 Progress and regress in SDG aspirations in Asia and the Pacific



Source: UNESCAP 2023. Asia and the Pacific SDG Progress Report 2023, and UNDP SDG Push Diagnostics

The underlying weaknesses were revealed by the confluence of the pandemic, geo-political upheavals and the cost-of-living crisis.[117] The challenges were further compounded in 2024, when 11.5 percent of animals were lost to dzud weather[118], which could impact progress in human development and in reducing poverty and inequality across Mongolia.[119] Both small- and larger-scale herders suffer animal loss but the small herders have less capacity to bounce back because they find it more difficult to secure bank loans.[120]

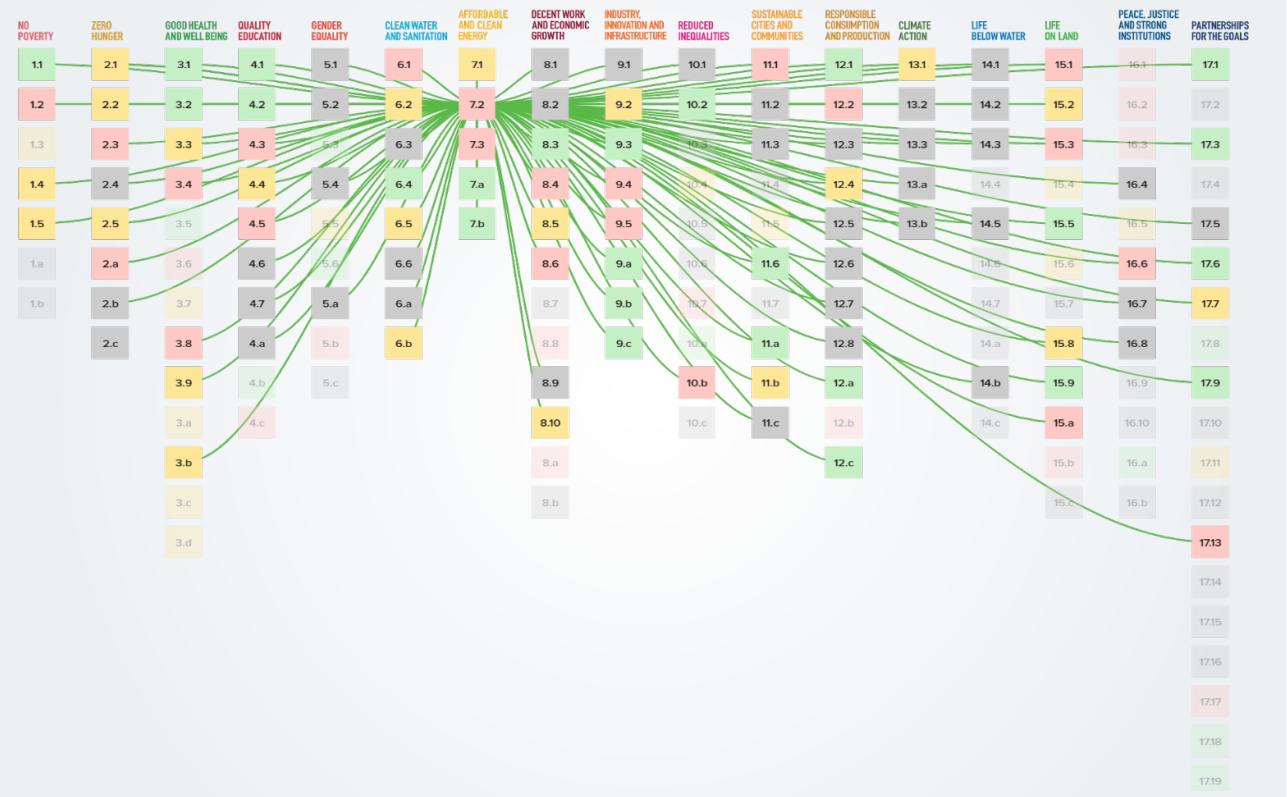
At the same time, geopolitical upheavals and climate change are contributing to increasing uncertainty. The World Energy Monitor has assessed Mongolia's most critical uncertainties. As indicated in Figure 1-19, these are climate change management, geopolitics, and cyber security. Most of the indicated actions needed also relate to energy and the market economy.

Figure 1-19 Critical uncertainties and actions needed

Source: World Energy Issues Monitor (2022) Asia

The centrality of energy for the SGDs is illustrated in Figure 1-20 which shows that the energy sector has multiple linkages with many other Goals so investing in a just energy transition has the greatest potential for achieving the SDGs.[121]

Figure 1-20 Renewable energy interlinkages



Source: UNDP SDG push diagnostics

Mongolia's priorities can also be set in the wider context, as indicated in global and regional human development reports which foresee a turbulent future. The **Asia Pacific Regional HDR 2023**, for example, warned that climate change and global crises are resulting in unmet aspirations, and greater human insecurity and uncertainty. The global **Human Development Report**, released in March 2024, concluded that crises and internal polarization impeded investments and global collaboration in tackling climate change. To achieve the SDGs and net zero by 2050 the reports urge investments in renewable energy.

The next chapter sets the stage for this transition, with a closer examination of Mongolia's distinctive energy system.

Endnotes and references

1 (UNDP, 2024a).
2 (UN Mongolia, 2023).
3 (UNDP, 2023b).
4 (UNDP, 2024).
5 (UN News, 2023).
6 (Sun, Zhang, Wang, & Shao, 2023).
7 UNDP, 2023b.
8 As articulated in the 1990 Human Development Report: 'Human development is a process of enlarging people's choices. The most critical ones are to lead a long and healthy life, to be educated and to enjoy a decent standard of living. Additional choices include political freedom, guaranteed human rights and self-respect – what Adam Smith called the ability to mix with others without being "ashamed to appear.'
9 (UNDP, 2023b).
10 (UNDP, 2023b).
11 It is 18th largest country in terms of land size spanning a vast expanse of 1,564,116 km^2.
12 According to the 2020 Population Census, the total population size is 3.5 million inhabitants.
13 (NSO, 2023).
14 (UNDP, 2023c).
15 (UNDP, 2023c).
16 (UNDP, 2023b)
17 (UNDP, 2022)
18 Expected years of schooling is the number of years a child of school-entry age is expected to spend in formal education.
19 Mean years of schooling quantifies the average number of years of education received by the adult population.
20 (UNICEF, 2021).
21 The detailed technical notes on Human Development Index, Gross National Income PPP and Data sources can be found at (UNDP).
The data reported in different sources can differ due to time lag involved in calculation, validation, publication, and reporting.
22 (NSO, 2024a).
23 (NSO, 2024a).
24 (NSO, 2024a).
25 (ADB, 2022b).
26 (NSO, 2024a) and (World Bank, 2022d).
27 (NSO, 2020).
28 According to (ADB, 2022b), "Working women spend approximately three times more on caregiving duties and household chores than working men, and account for 75.9% of non-paid work in family-owned businesses. Despite having higher educational attainment than men, Mongolian women are less likely to be active in the labour market and earn less than men on average."
29 This is in sharp contrast to the mining sector which contributes 28.2 percent to GDP yet absorbs hardly 5 percent of the labour force (NSO, 2024a).
30 (Department of Commerce USA, 2016).
31 (NSO, 2024a)
32 (ADB, 2021c).
33 (Graceffo, 2022b).
34 (ADB, 2021c).
35 (ADB, 2021c).
36 (ADB, 2021c).
37 (Kingsley, 2017).
38 (Kingsley, 2017).
39 (Kingsley, 2017).
40 (Graceffo, 2022b).
41 (NEMA, 2024)
42 (United Nations, 2024).
43 (Khankhuu, 2024)
44 (NSO, 2024a).
45 (BOM, 2024).
46 (Brown & Fox, 2022).
47 (NSO, 2024a).
48 (NSO, 2024a)
49 (Kingsley, 2017).
50 (IOM, 2023).
51 (IOM, 2023).
52 (World Bank, 2022d).
53 (IOM, 2023).
54 (Brown & Fox, 2022).
55 (Brown & Fox, 2022).
56 (Jun, 2021).
57 (Mendee, Altanzaya, & Undrakh, 2022).
58 (IOM, 2022)
59 (Mendee, Altanzaya, & Undrakh, 2022).
60 UNICEF, 2018.
61 (UNDP, 2024f (forthcoming))
62 UNICEF, 2018.
63 Newell, 2018.
64 UNDP, 2019.
65 (UNICEF, 2023).
66 (ADB, 2018).
67 (UNICEF, 2023).

68 (Wu & Cui, 2019)

69 (UNICEF, 2018)

70 Children breath at twice the rate of adults and are more vulnerable (UNICEF, 2018).

71 (UNICEF, 2023).

72 (UNICEF, 2023).

73 (UNICEF, 2020).

74 (UNICEF, 2023).

75 (IHME, 2024)

76 (Ren Yaun, 2023).

77 (UNDP, 2024f (forthcoming)).

78 (UNDP, 2024f (forthcoming))

79 (Hincks, 2018).

80 (Sambuu, Gunsmaa, Badarch, Mukhtar, & Ichikawa, 2023).

81 (Qiang, 2021).

82 (World Bank, 2020a).

83 (Sambuu, Gunsmaa, Badarch, Mukhtar, & Ichikawa, 2023).

84 (Jun, 2021).

85 (IRENA, 2023a)

86 (World Bank, 2020a).

87 (Carlisle & Pevzner, 2019).

88 (World Bank, 2020a).

89 (World Bank, 2020a).

90 (UNDP, 2023d)

91 The most recent survey data that were publicly available for Mongolia's MPI estimation refer to 2018. https://www.undp.org/sites/g/files/zskgke326/files/migration/mn/HDR2020_Mongolia-Summary_English.pdf .

92 Average proportion of deprivations which is experienced by multidimensionally poor individuals. To compute intensity, the weighted deprivation scores of all poor people are summed and then divided by the total number of poor people.

93 The MPI value is the share of the population that is multidimensionally poor adjusted by the intensity of the deprivations (UNDP, 2023a).

94 The health and education dimensions reported in MPI are based on UNICEF's MICS. According to MICS 2022 approximately 29 percent of the population face food insecurity. While MPI reveals 21.1 percent of deprivations are accounted for health, according to UNICEF 2023 Mongolia Country Profile, under 5 mortality rate is 14.7 percent (UNICEF, 2024). Approximately 6 percent of population use unimproved sanitation facilities, and 8 percent lack access to basic and clean drinking water. These could in turn impact life expectancy of Mongolians. Educational deprivation contributes 26.8 percent to MPI 2018. MICS 2022 reveals that 17 percent of children (15 percent male and 18 percent female) are not on track in literacy-numeracy, physical, social-emotional, and learning domains, and early childhood development. The negative impact of these is becoming pronounced in educational inequalities affecting overall human development outcomes (Box2 and figure 9). UNICEF last MICS reports can be accessed here (UNICEF, 2022).

95 (UNDP, 2023a).

96 According to MPI 2018 estimates 1.5 percent people lack access to electricity, however, the latest UNESCAP 2024 SDG 7 Roadmap asserts on 0.5 percent of Mongolia's population lacked access to electricity in 2021. Based on this trend, it is expected that Mongolia will close the electricity access gap by 2024 (UNDP, 2023d).

97 (UNICEF, 2022).

98 (UNESCAP, 2024).

99 (UNICEF, 2022).

100 (Reach Project, 2020).

101 (World Bank, 2020b; Access Solutions LLC., 2019; World Bank, 2020b).

102 (World Bank, 2015).

103 (UNDP, 2021)

104 To measure the impact of inequality on human development, UNDP uses Inequality Adjusted Human Development Index (IHDI). The IHDI accounts for inequalities in HDI dimensions by "discounting" each dimension's average value according to its level of inequality. The IHDI value equals the HDI value when there is no inequality across people but falls below the HDI value as inequality rises. In this sense, the IHDI measures the level of human development when inequality is accounted for. The loss in Human Development due to inequality is measured as the percentage difference between the HDI and IHDI, expressed as a percentage of the HDI.

105 (NSO, 2020).

106 (UNDP, 2024e).

107 (World Bank, 2023a).

108 (GOM, 2023a)

109 (UNDP, 2024f (forthcoming))

110 (Global Forest Watch, 2024)

111 (UNDP, 2024f (forthcoming)).

112 (World Bank & ADB, 2021d).

113 Please refer to (GIZ, 2023).

114 Please refer to (UNEP, 2018).

115 (UNDP, 2023c).

116 Among other emerging economies of the region Mongolia is relatively performing better and its economic outlook remains strong. In recent years high inflation especially in food and transportation prices have negatively affected almost all segments of population. Mongolia's export led growth strategy has worked for the most part, however, volatility in world commodity markets and the recent economic slowdown in China's property market is casting a shadow on Mongolia's exports of minerals such as iron ore and copper (ADB, 2023b). On macroeconomic front the country is making decent progress and is managing its debt diligently, which places the country in a favourable standing among emerging markets. While Mongolia's macro-debt pressures have moderated in the past few months, but the risks remain elevated. The world is advancing towards net-zero climate adaptation hence exports of coal and related products will gradually decline overtime which requires Mongolia to future proof its growth ((GOM, 2023).

117 (UNDP, 2024a).

118 (NEMA, 2024)

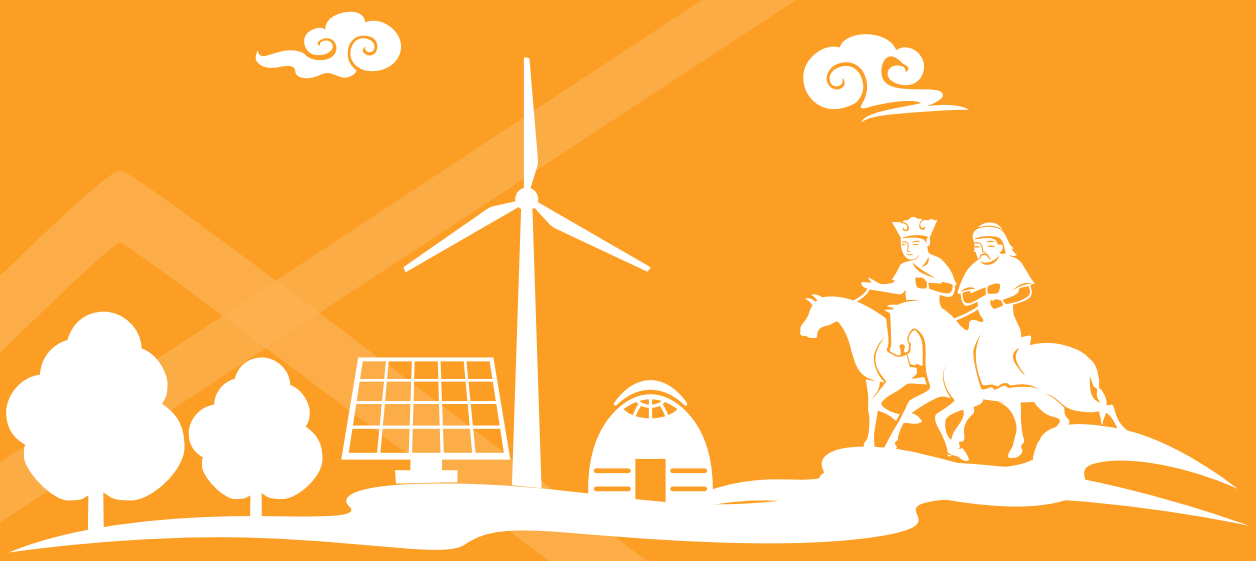
119 (UN News, 2024).

120 (United Nations, 2024)

121 (UNDP, 2023e).

CHAPTER 2.

A COAL-BASED ENERGY SYSTEM



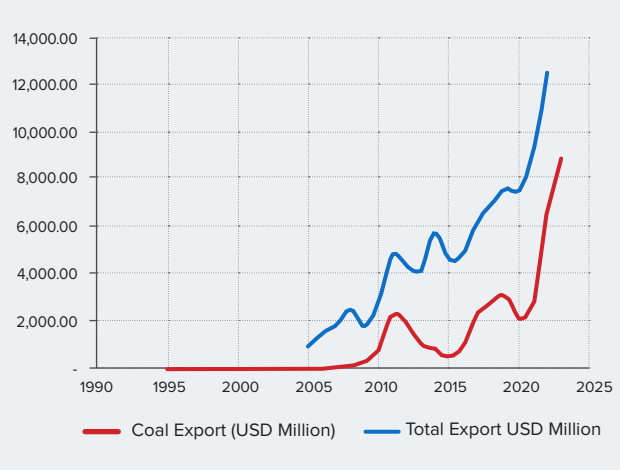
A COAL-BASED ENERGY SYSTEM

Mongolia has a distinctive energy system based on coal, which in Ulaanbaatar and other urban centres is used for power generation and district heating supply through combined heat and power (CHP) plants, as well as for coal-fired heating in stoves in its distinctive ger housing. This energy system takes advantage of an abundant natural resource but is inefficient and bad for human health and the climate and leaves the country vulnerable to external shocks. In future, Mongolia's energy policies should align more with its broader human development goals, on a journey towards sustainable economic growth, social inclusion, energy security, and partnerships for global energy policy and climate mitigation.

Mongolia has high-quality coking and lignite coal deposits, estimated at 165 billion tonnes.[1] In 2023, the country produced 81 million tons of coal, a 118 percent increase from the previous year, of which 70 million tons was exported, mostly to China.[2]

Due to unprecedented COVID-19 restrictions and demand shocks from China the price surged (Figure 2-2) as did the volume of exports (Figure 2-1). The share of coal in total exports increased from 2.5 percent in 2005 to 30 percent in 2021 and to 58 percent in 2023. Though the price is back to pre-COVID levels the volume of exports is increasing due to peaking demand from China. Indeed, over the last decade, Mongolia's economic boom and development has largely been powered by the mining of coal, copper, and other minerals. To facilitate coal and mineral production, mining areas have benefited from rapid infrastructure development, particularly railways and roads.

Figure 2-1 Mongolia's coal and total exports



Source: NSO 2024

Figure 2-2 Global coal price surge, $ per ton

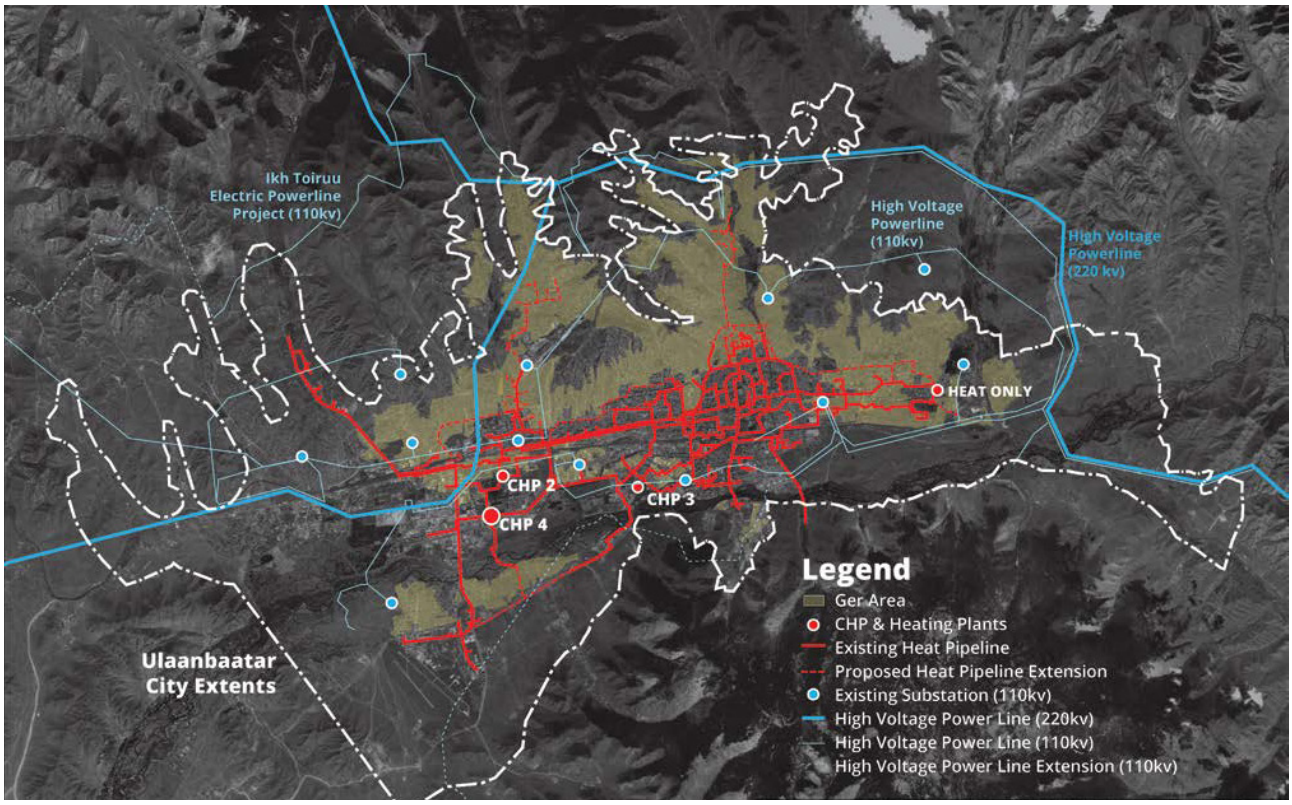
Source: tradingeconomics.com

Energy production and consumption

Besides generating exports, coal is also used to produce energy and thus powers the economy. The urban and industrial core of Ulaanbaatar is covered by three outdated CHP plants which produce electricity and hot water for the city's district heating system. This provides hot water and as well as steam for heating through a piped loop to downtown government, commercial, and apartment buildings. There are also several smaller coal-fired, heat-only boilers. For buildings situated near its distribution network this system has been reasonably cost-effective and efficient.

But it covers less than 40 percent of the city's population.[3] Most of the rest live in unplanned 'ger areas.' New housing and commercial developments and ger areas are not connected to the district heating network.[4] The ger houses are not properly insulated and the electricity connections do not have the capacity to sustain full electric heating. Hence, ger area households instead use coal-burning stoves and small, inefficient boilers for cooking and heating needs – resulting in the annual consumption of over a million tons of raw coal.[5] In extreme winters when temperatures drop below -30°C, the ger walls offer minimal insulation, necessitating the use of more coal to maintain warmth.

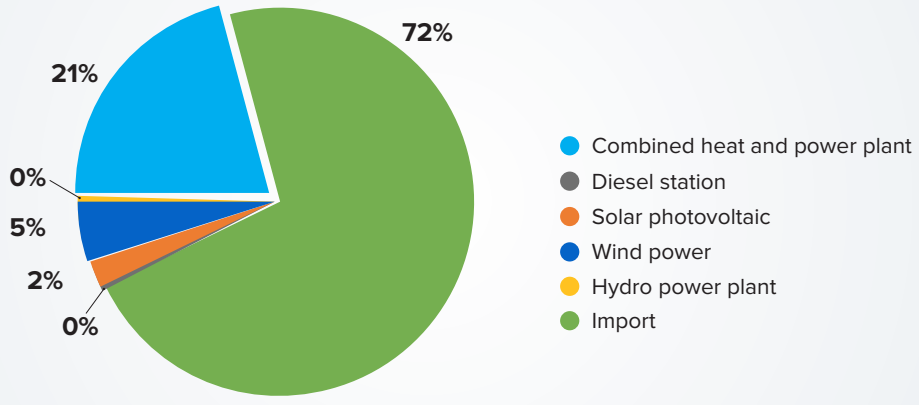
Figure 2-3 Ulaanbaatar heat and power infrastructure



Source: Carlisle and Pevzner 2019

Mongolia's pattern of electric power production is indicated in Figure 2-4. Around 72 percent is produced by coal fired power plants, and some from renewables, but around one-fifth of electricity is imported from China and Russia.

Figure 2-4 Mongolia power generation

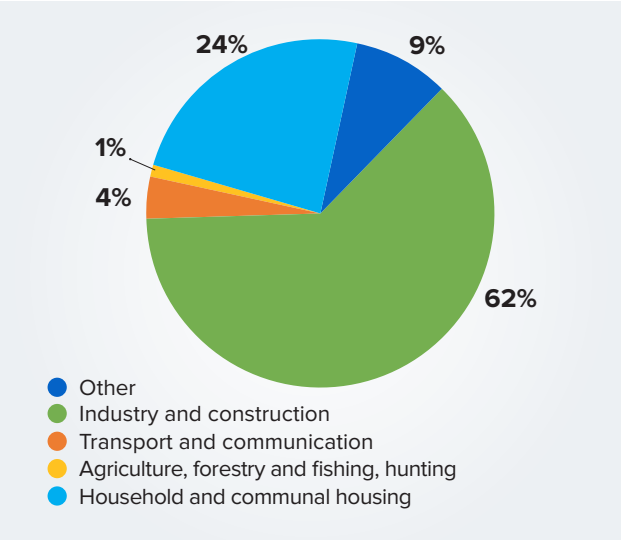


Source: Energy Balance Statistics, National Statistical Office

The pattern of consumption is illustrated in Figure 2-5. Since 1990, the proportion going to households has increased from 13 to 24 percent.

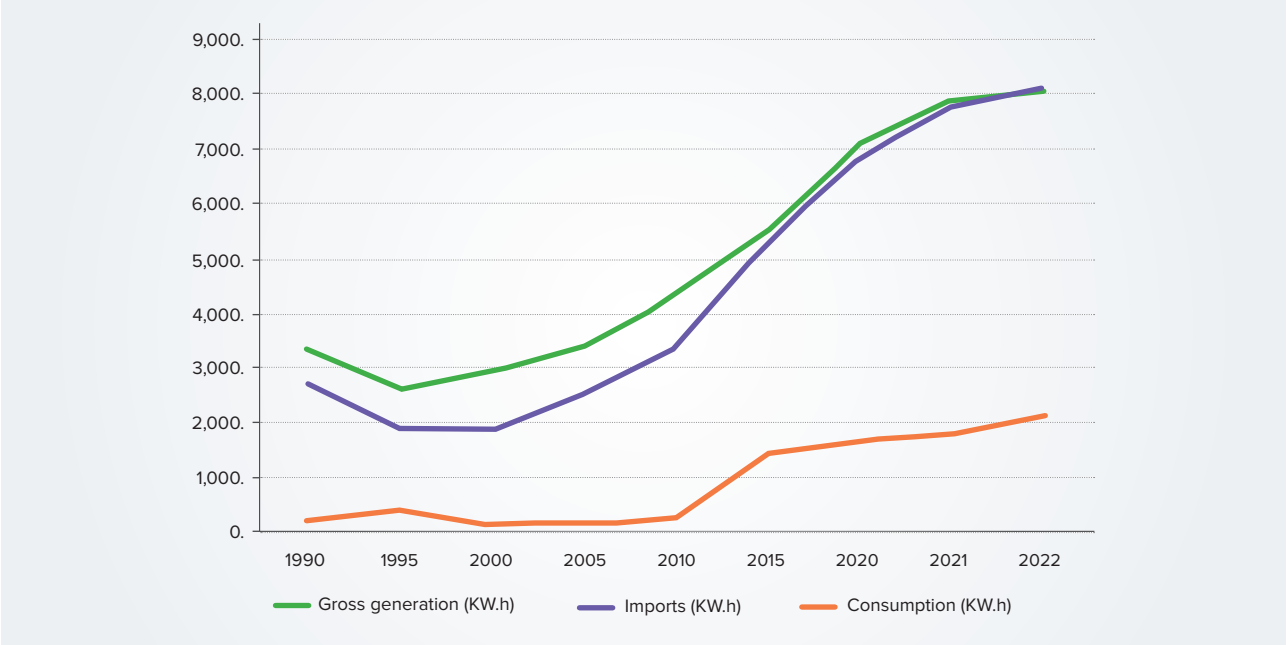
Electricity and heat demand has increased rapidly over the past decade (Figure 2-6). Between 2000 and 2022, per capita electricity consumption increased from 1,031 kWh to 2,572 kWh[6] due to a number of factors, including population increase and industrial activity.[7] Demand is projected to increase further up to 2030 – at a compound annual growth rate of 4.3 percent for electricity[8] and 3.4 percent for heat.[9] Consumption has now overtaken domestic production, so the gaps need to be filled by imports. This situation is likely to get worse. Between 2020 and 2050, electricity demand is forecast to double.[10]

Figure 2-5
Mongolia energy consumption patterns



Source: Energy Balance Statistics, National Statistical Office

Figure 2-6 **Electricity production and consumption, 1990–2022, kWh**



Source: Energy Balance Statistics, National Statistical Office

In December 2023, Russia announced reduced exports of electricity to Mongolia. Meanwhile, energy demand continued to increase so the Government was forced to implement load shedding for households during peak hours in Ulaanbaatar and several provinces – and this is expected to get worse in future.[11] Electricity disruption can impact business and communication operations, online learning, health systems, ATMs, filling stations, traffic signals, and electric transport. This severely affects economic operations during peak hours and necessitates self-reliance in energy production and supply.

Aging infrastructure

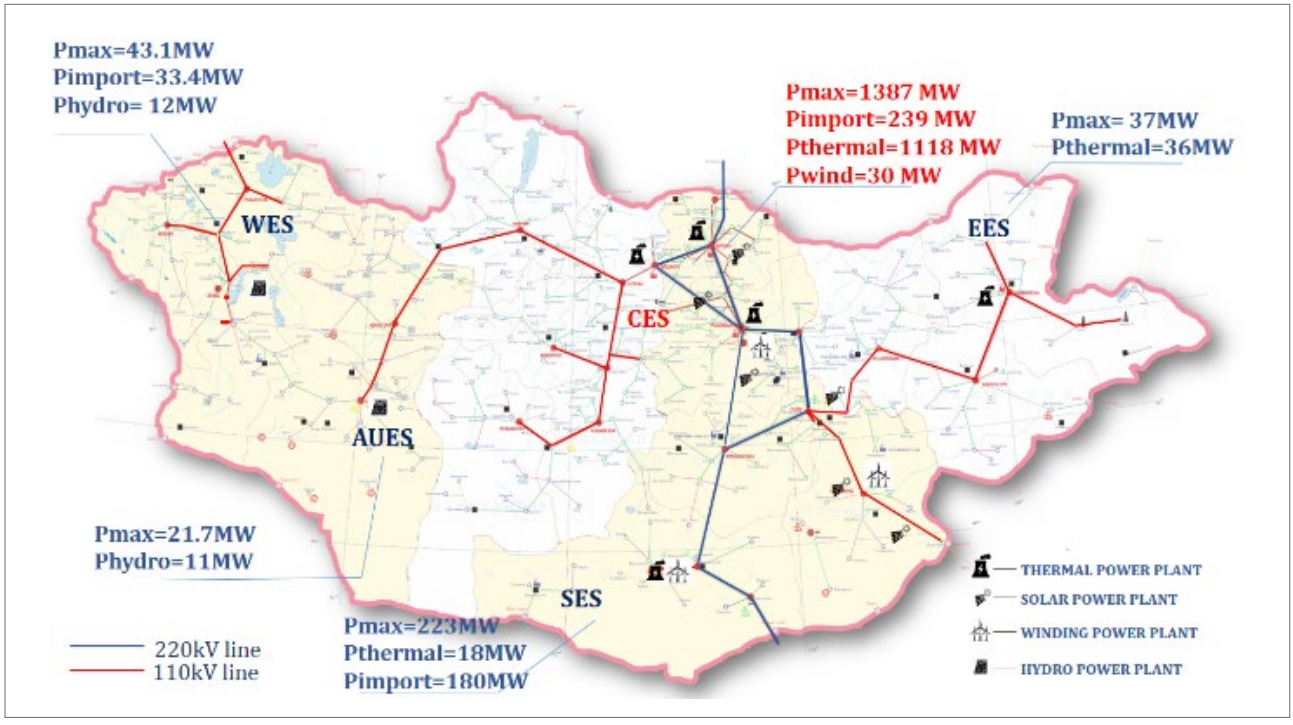
Most of the centralized district heat infrastructure was built more than 60 years ago and has become inadequate and unreliable, and there are considerable system losses. The oldest plant was constructed in the 1960s.[12] Due to insufficient investment and maintenance, the pipelines are deteriorating and over half require urgent repairs.[13] Any update of these systems would involve huge capital investment.

As consumption has risen, Mongolia's energy system, which had been dependent on Russian and Ukrainian suppliers, faced challenges in servicing power plants and transmission networks. The war in Ukraine and related sanctions could have serious consequences for the supply of equipment and parts for thermal power plants.[14]

A segmented grid system

The transmission distribution system is not linked throughout the country. Instead, there is a grid infrastructure divided into four segregated electric power regions: Central, Eastern, Western and the Altai-Uliastai systems (Figure 2-7). Electric power is supplied from these systems to aimags through a 58,188 km-long power transmission network.[15] However, the potential benefits of load sharing and of vast solar and wind options in the southern part of the country are limited by the absence of a smart and interconnected transmission grid.

Figure 2-7 Mongolia's segregated energy generation system



Source: M. Battulga et.al. 2022

The system began encountering significant challenges in 2022 as demand edged closer to the limits of supply (Figure 2-6). In December 2023, as the harsh winter descended, due to technical issues in two power stations the Government announced load management measures. The Ministry of Energy warned that 150 soums of six provinces could experience electricity cut-offs for 2-3 hours.[16] Additionally, the ERC reported that the power system reached a peak load, increasing to 1,465 MW putting extreme stress on the energy infrastructure and making it vulnerable to demand surges.[17] This is not the first time this has happened. The total electricity generation capacity is only 1,500 to 1,600 MW, which includes 250 MW of solar and wind, leaving very little reserve capacity to accommodate sudden surges of demand. A 50-megawatt battery storage plant should become operational in November 2024,[18] but without further investments in the energy infrastructure, Mongolia's economy will be highly vulnerable to energy shocks.

Subsidizing low consumer prices

Mongolia is subsidizing residential electricity and heat consumption. The prices for consumers are kept artificially low. This has resulted in waste of energy by households. With low charges for central district heating, and the absence of heating controls in most buildings and an adequate metering system, people have little incentive to conserve energy.

Recent analysis supported by UNEP reveals that Mongolia spent 37,740 billion MNT on electric energy subsidies in 2023, an increase of 120 percent over 2018.[19] Energy subsidies offer the greatest benefits to high-income households who consume more energy than lower-income groups, thereby exacerbating income and energy inequalities.[20]

Nevertheless, a suggested increase in energy tariffs could worsen the plight of people living below the poverty line. It might also impoverish people marginally above the poverty line.[21] Any tariff increase would therefore negatively impact vulnerable populations, so such actions must be taken gradually and accompanied by targeted measures for energy social protection.

The potential for renewable energy

Mongolia has vast potential for renewable energy – particularly in wind and solar in the south of the country. The combined wind and solar potential in Mongolia is estimated at 2.6 terawatts (TW).[22] Hence, the country can easily meet its energy demands from renewable energy systems.

In 2007, the Renewable Energy Law introduced a feed-in-tariff of $0.15/kWh-$0.18/kWh for on-grid solar and $0.08/kWh-$0.095/kWh for wind energy. This tariff was relatively high and over the last decade, it attracted power producers who invested in three wind farms of 152MW capacity and nine solar power plants with approximately 100 MW capacity. This brought renewable energy capacity to 18.3 percent of total power generation in Mongolia.[23]

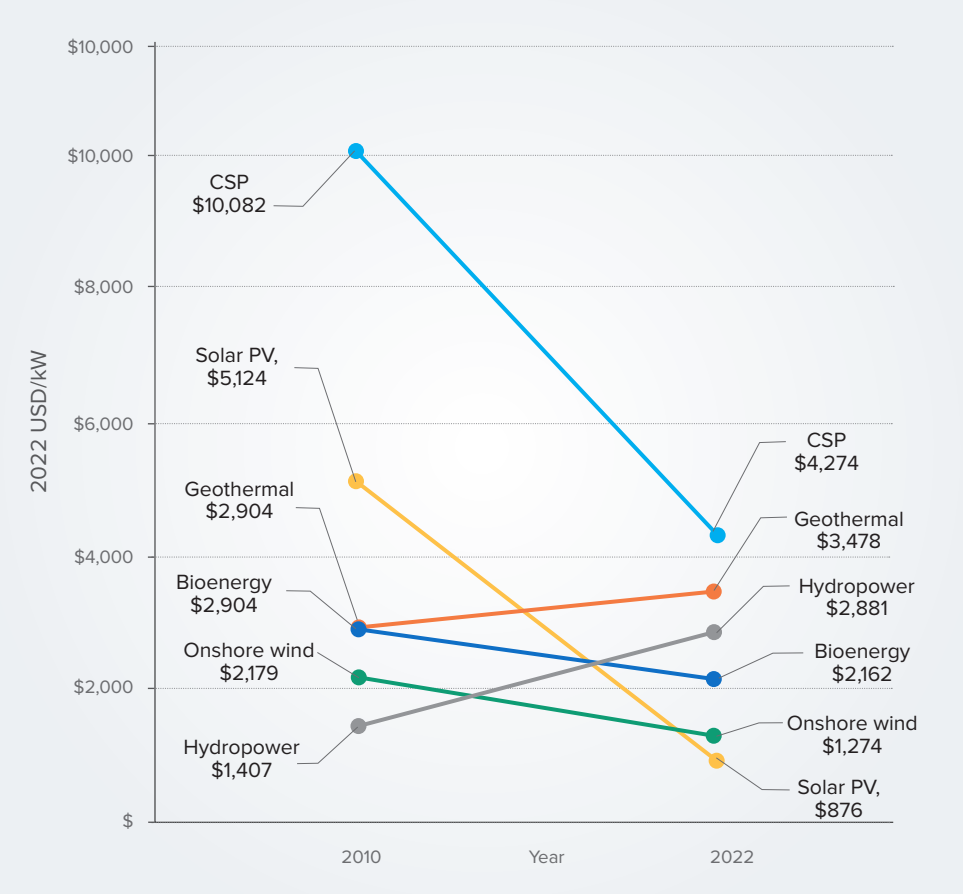
In 2019, an amendment to the Renewable Energy Law 2019 introduced a competitive feed-in tariff for new renewable energy investments, setting an upper cap at $0.12/kWh for solar energy and $0.085/kWh for wind.[24] The law also mandates that new renewable energy generation capacities must be awarded through an auction process. In Uzbekistan in 2023, a much lower price of $0.018 per kWh has been achieved through open auctions of solar PV projects in Jizzakh and Samrkand.[25] This became possible due to two conditions – the recent decline in the cost of renewable energy inputs and the larger scale of energy production.[26] However, in the case of Mongolia, these prices are difficult to achieve in older installations and the size of the power generation capacity auctioned in future needs to be bigger to take advantage of the economies of scale.

Future pricing of coal and renewable energy

While Mongolia continues investments in coal power plants, coal will not remain the cheapest and most viable option or a reliable long-term source of energy sustainability and security.[27] In assessing the relative economic viability of combined heat and power plants and renewable sources, the fundamental metrics are the long-run marginal cost (LRMC) and the levelized cost of energy (LCOE).[28]

Between 2010 and 2022, the cost of renewable energy generation in many advanced and emerging economies fell considerably (Figure 2-8). The largest declines were for solar photovoltaic (PV), concentrated solar power (CSP), and onshore wind energy.

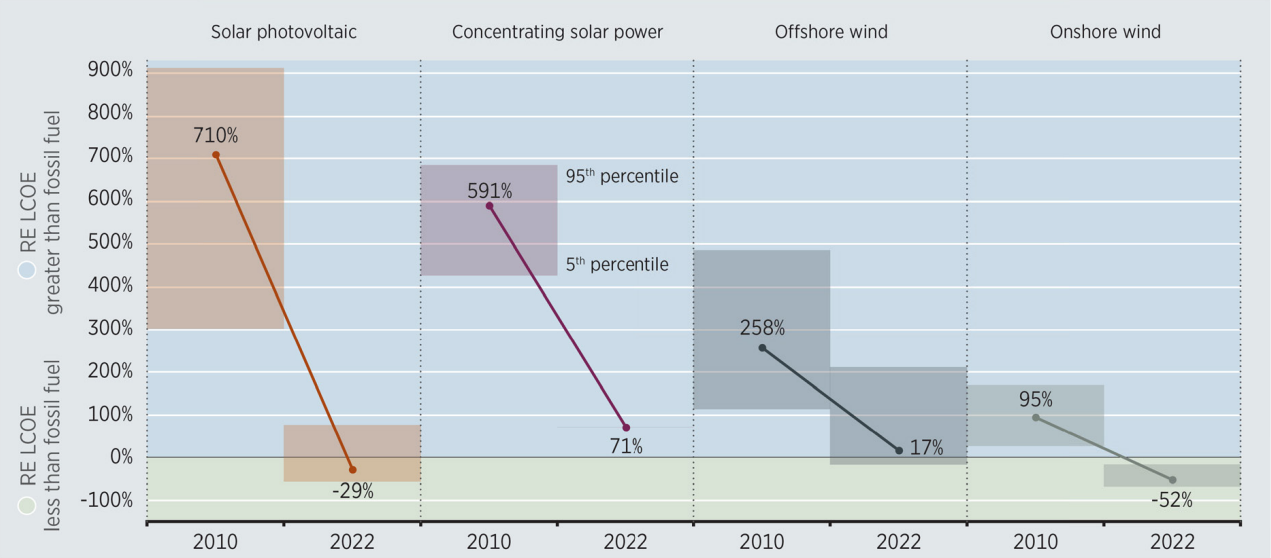
Figure 2-8 Global electricity generation cost comparisons



Source: IRENA 2022

In 2010 globally, solar PV renewable power generation was 710 percent more expensive than the cheapest fossil fuel-fired solution; but in 2022 it cost 29 percent less – despite significant increases in the prices of PV modules (Figure 2-9).[29]

Figure 2-9 Global Solar and wind competitiveness based on global weighted average LCOE, 2010-22

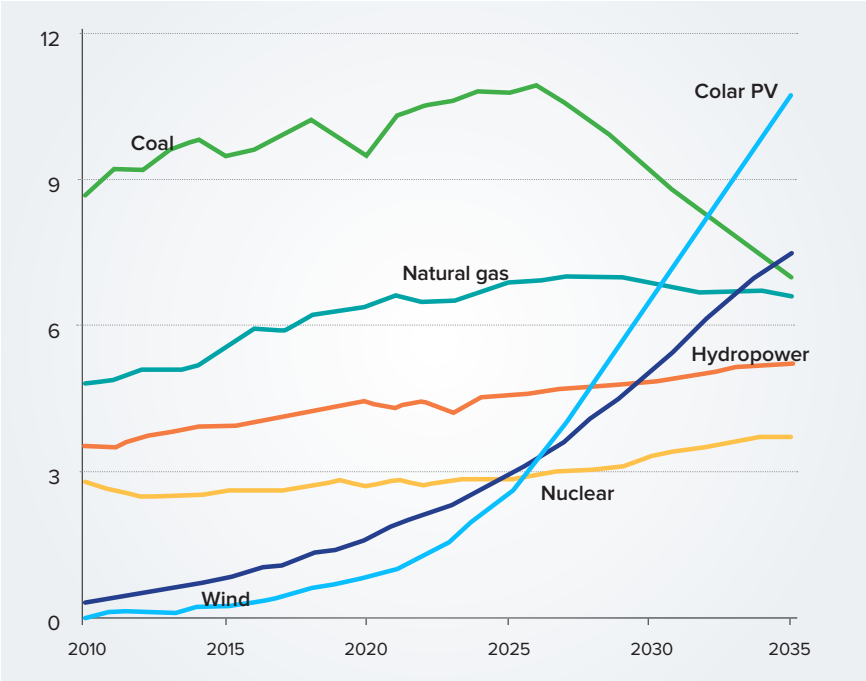


Note: The global weighted average LCOE data by technology and the fossil fuel LCOE data used to derive this chart is presented in detail in Chapter 1; RE = renewable energy.

Source: IRENA 2022

Global projections further suggest that the critical threshold will be reached by 2030 (Figure 2-10), rendering most of the world's coal-fired plants economically unviable. For a coal-based economy like Mongolia, this would have pressing implications. The existing coal-fired power plants, some of which have been in operation since the 1960s and 1980s, risk not only operational disruptions but becoming economically unviable by 2030.[30]

Figure 2-10 Global electricity generation 2010-2035[31]



Source: IEA 2024

Continuing investment in coal-fired plants

In the short term, Mongolia's coal reserves offer energy security, and the country could continue to use coal to produce 90 percent of electricity for domestic use, meeting shortfalls with imports from Russia. However, investors and financing institutions have stopped direct financing of coal power generation. So sustaining coal-based energy will become increasingly difficult. The reluctance to transition to renewable technologies is partly due to the country's extremely cold winter climate. Solar panels experience a significant drop in efficiency in such low temperatures, often reducing to about 30 percent of their optimal performance.

Under the New Economic Recovery Policy, the Government has identified 22 power-sector projects with a major focus on existing and new coal CHP plants and transmission infrastructure, at a cost of $50 billion. If a coal-powered energy infrastructure expansion plan is implemented, CO_2 emissions will increase further. However, the Government has experienced significant setbacks in financing new CHP plants as global investors and International financial institutions prefer to invest in renewable power systems.

Renewable power generation, such as solar and wind, offers a hedge against future fuel price uncertainties. Once the initial investment is recouped, renewables provide power at a stable low cost perpetually – along with substantial health, safety, and environmental benefits.

The confluence of global energy trends, the aging infrastructure of existing coal facilities, and the inexorable rise of renewables emphasizes the need for transitioning away from coal and embracing alternative energy sources.[32] The next chapter shows how beneficial such a transition would be.

Endnotes and references

1 (JICA, 2013).

2 (TheCoalTrader, 2023).

3 (Carlisle & Pevzner, 2019).

4 (ADB, 2018).

5 (Wu & Cui, 2019).

6 (IEA, 2024)

7 The Oyu Tulgoi mine operation would require more than 170 MW per year (Munkhzul, 2022).

8 (UNESCAP, 2024).

9 (ADB, 2018).

10 (GIZ, 2020).

11 (Crisis24, 2023).

12 (ERC, 2023b).

13 (IRENA, 2023a).

14 (UN, 2023).

15 (ERC, 2023b).

16 (IKON, 2023).

17 (ERC, 2024).

18 (ADB, 2020)

19 In2018 the Government provided 17,150.0 billion MNT in 2018 to energy companies (ERC, 2023b) (MEEI, 2024).

20 (UNDP, 2021).

21 (ERC, 2023c).

22 (ADB, 2020a).

23 (GGGI, 2020).

24 Renewable Energy Law of Mongolia, 2007 amended in 2015: hps://www.legalinfo.mn/law/details/465

25 (Government of Uzbekistan, 2023).

26 (IFC, 2023).

27 (IRENA, 2023b)

28 The LRMC is the ongoing operational expenses of a power plant subtracted from the value of the energy it generates. The LCOE encompasses both the LRMC, and the capital cost associated with constructing the power plant. At some point, the LCOE of new renewable energy sources dips below the LRMC of existing coal-fired power plants making it more cost-effective to establish new renewable energy infrastructure than to continue operating coal-fired facilities. (Roberts, 2020).

29 (IRENA, 2023b).

30 (Roberts, 2020).

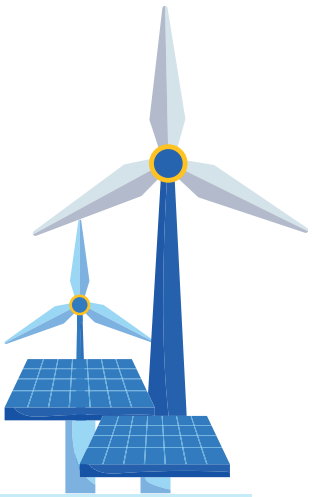
31 (IEA, 2024)

32 (Deloitte, 2016; Deloitte, 2016b).

CHAPTER 3.

BENEFITS OF A JUST ENERGY TRANSITION

BENEFITS OF A JUST ENERGY TRANSITION



An energy transition in Mongolia from fossil fuels to renewable sources would reallocate resources and wealth. This would benefit some people but could adversely affect others. To ensure fairness the Government will therefore need to intervene – aiming for a transition that benefits all stakeholders and leaves no one behind. A truly just energy transition would set Mongolia onto a new human development trajectory.

A just energy transition (JET) is a subset of the broader concept of a just transition. A JET is not just about technological advances and environmental benefits. It is also based on principles of human development which include social, economic, and environmental justice and fairness (Box 3-1).[1]

BOX 3-1 Eight core principles of a just energy transition

For a just transition, UNDP has identified eight core principles. A JET should be science-driven, fair, sustainable and inclusive, engaging stakeholders and aiming for climate justice, with access to energy and to information.[2]

1. Science –driven
2. Fair
3. Sustainable
4. Inclusivity
5. Stakeholder Engagement
6. Climate Justice
7. Energy Access
8. Access to Justice and Information

Source: UNDP 2023

Principles of a just energy transition

1. **Guided by science:** urgency to reduce emissions in line with the Paris Agreement.
2. **Fairness:** uphold the rights, needs, and values of everyone, avoiding privilege for any group.
3. Sustainability: wider strategies for the energy transition to limit global temperature increase.
4. **Comprehensive and inclusive:** just transition strategies developed nationally, co-designed and implemented locally.
5. **Stakeholder engagement:** ensure robust engagement, social dialogue, and gender equality for equitable benefits.
6. **Climate justice:** equitably share the burden and costs of climate change internationally and inter-generationally.
7. **Energy access:** recognize this as essential for societal wellbeing, economic growth, and sustainable development.
8. **Access to justice and information:** common investment approach upholds rights, ensures meaningful participation for all stakeholders.

A JET does not just mean phasing out fossil fuels but also phasing out a political, cultural, and social legacy that favours carbon-intensive choices for economic decision making. To ensure that the discussions are comprehensive, Mongolia needs to engage all stakeholders with eagerness and vigour to negotiate a JET framework around socio-economic issues – related to coal phase-out, energy costs and subsidies, labour relations, and policy and regulatory obstacles, with particular concern for gender equality. In short, a JET provides a framework for economic, social, and environmental fairness.

Economic justice – Reallocating resources in a manner that is equitable and sustainable will mean leveraging financing mechanisms. These should include fiscal incentives to support business opportunities, skills development, and employment creation, building a renewable energy industry that can boost economic growth and improve livelihoods, with particular attention to gender equality. A JET also identifies trade-offs between a rapid low-carbon transition and maintaining macroeconomic stability.

Social justice – The transition will also mean engaging in social dialogues and empowering marginalized groups to make economic decisions that can enable healthy and fulfilling lives. For this purpose, the Government needs to ensure access to essential services and resources, while also providing social security and assistance.

Environmental justice – This means rectifying historical environmental harms and ensuring that future generations inherit a clean, healthy environment. A JET considers the long-term impacts of pollution and resource depletion and focuses on equitable access and decision-making, particularly for marginalized communities. Action on meeting climate goals and pivoting to net zero should be based on principles of equity, inclusivity, and human rights and take a whole-of-society approach – embracing all communities, workers, and social groups.

These issues, while complex and sometimes difficult, also open numerous opportunities for promoting human development: on the economic front, by increasing economic growth, enhancing productivity and economic diversification; on the education and skills front, by strengthening inclusive science, technology, engineering, and mathematics education and skills development, especially for women; and on the health front, by reducing air pollution and promoting robust ecosystems. The following sections summarize the main human development opportunities.

A healthier and more productive population

Widespread use of solid fuels for indoor heating and cooking has devastating health implications for everyone, but particularly for older people, pregnant women, and children. A JET encourages cleaner alternatives, such as solar electric stoves and heaters which can substantially reduce levels of pollution.

Improving air quality will offer immediate respiratory benefits. With cleaner air comes a healthier, more vibrant workforce that takes fewer days off sick, reducing economic losses for both businesses and families.

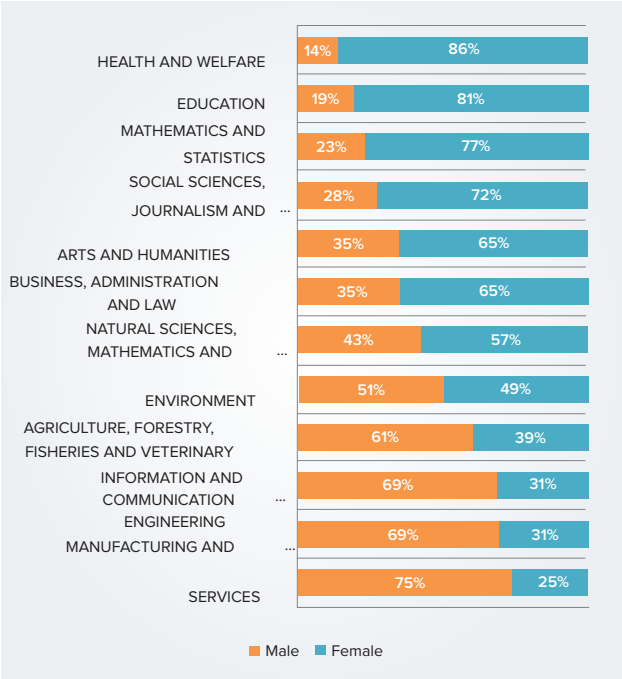
Caring for sick family members is typically the responsibility of women. Reducing illnesses would boost women's productivity and access to the labour market. In embracing a JET, Mongolia can not only address its current health and environmental challenges but also pave the way for a more sustainable and economically prosperous future.

A future-fit education system

The Education Sector Plan for 2021-2030 aims to ensure that Mongolian citizens can thrive as active participants in digital- and knowledge-based societies. It also aims for a lifelong learning environment through high-quality, open, inclusive, and flexible education services.[3] A just transition will reinforce these efforts since it means moving to more sophisticated technologies. For this purpose, Mongolia will need to build critical skills, by increased investments in education, especially in the critical STEM subjects of science, technology, engineering, and mathematics'.[4]

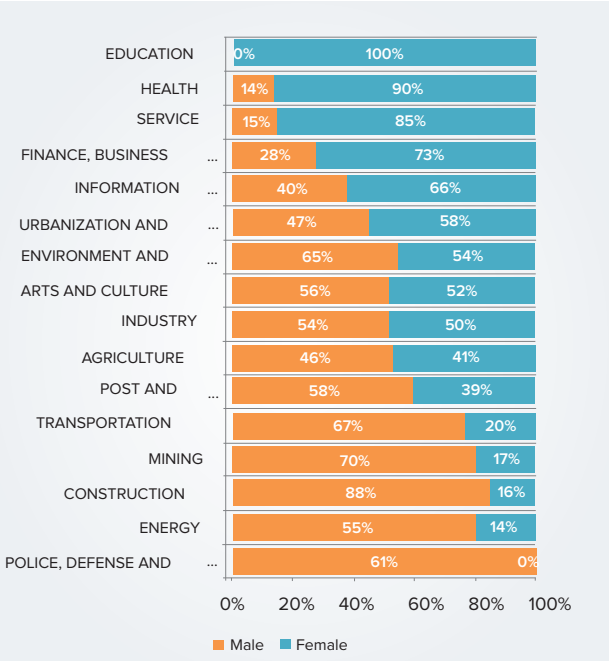
In particular, a JET needs to take advantage of the potential of Mongolia's women. The gender pattern of tertiary education is indicated in Figure 3-1. Women make up a high proportion of natural science graduates but are under-represented in information and communications and in engineering and manufacturing. There is a similar imbalance for technical and vocational education and training (TVET): women are less than 30 percent of graduates in transportation, mining, construction and energy (Figure 3-2).[5]

Figure 3-1 Graduates from tertiary education institutions, 2022



Source: NSO

Figure 3-2
Graduates from TVET institutions, 2022



Source: NSO

While Mongolia has made significant progress in education, it is not realising the potential of its young talent by ensuring high-skill job opportunities. Even women who graduate in STEM fields tend to take longer to enter the workforce – often hindered by family responsibilities, a difficult work-life balance, and a lack of social capital.

Inclusive JET-focused STEM and TVET policies should ensure that Mongolians have the right education and skills for labour market gaps. By investing in a JET, Mongolia can retain its educated labour force. But the country may also need to catalyse private investment in high-skill jobs – for example, by developing energy compacts that attract investors through private capital markets.

There are examples in the Asia-Pacific Region, from Pakistan and Bangladesh, where semi-government technology companies are training the rural workforce for solar energy, employing a flexible TVET qualification framework. Similarly, the German Solar Academy in Nairobi helps train the workforces of countries in the region, including Kenya, Tanzania, and Rwanda; and presents a replicable example for Mongolia.

Modernized agriculture and food security

A JET presents an opportunity for modernizing agriculture while improving food security. One major concern for rural communities is water scarcity, a consequence of the arid climate and over-extraction of groundwater resources. As part of a JET, they can shift to solar-powered wells. Even in the harsh Mongolian winters, herders could rely on consistent water supplies not just for their animals but also for their own health and livelihoods.[6]

Renewable energy can also be used more widely, displacing diesel in agricultural and food processing. For example, in water and drip irrigation hydroponics and aquaponics systems in greenhouses – as well as in animal and bird sheds, and plant nurseries – enhancing productivity and reducing environmental damage. Solar-powered irrigation can reduce diesel consumption by up to 1.3 million litres annually, reducing CO_2 emissions by approximately 3,500 tons each year.[7]

In Songinokhairkhan district, for example, the Monnaran 10 MW solar power plant has enabled the integration of solar energy into agricultural practices. Everyday Farm LLC, a joint Mongolian-Japanese company, uses solar power for drip irrigation, which can enhance water use efficiency by up to 95 percent.[8] The payback period for these solar-powered systems is only two to three years, making it a financially viable investment for farmers.[9]

Greater energy security

Investing in a JET would help build a more diverse and secure energy system. Mongolia's energy system is leaving the country dependent on external sources. The vast renewable energy resource instead offer a substantial buffer. Wind energy potential, for example, is estimated at 1.1 terawatt for electricity which could enable the country to produce 2,550 terawatt hours (TWh) of electricity annually (Figure 3-3).

There is an equally compelling case for solar energy. Mongolia averages between 270 and 300 sunlit days per year. With a solar intensity ranging between 4.3-4.7 kWh/m^2/day (Figure 3-4), annual solar energy generation could reach up to 4,774 TWh.[10]

Based on different estimates, the total combined renewable electricity production could thus reach 7,300 to 15,000 TWh per year, which is not only greater than current energy consumption in Mongolia but can also meet the energy needs of China by 2030.[11] If Mongolia was connected with the necessary transmission infrastructure the country could not only meet its own energy needs but those of neighbouring countries. By exporting excess renewable energy via a future Northeast Asia Grid, Mongolia could become an energy-exporting powerhouse, fundamentally shifting its position in regional energy geopolitics.

The potential does not end with sun and wind. There are also geothermal reservoirs, particularly in regions like Uvurkhangai, Bayan-ulgii, Khosgul, and Tuv, as well as in Ulaanbaatar, which present opportunities for decentralized energy production for both power generation and heating.[12] This could reduce the strain on Mongolia's segregated grid systems and offer localized energy security, especially during peak demand periods.

Figure 3-3 Mongolia wind energy potential

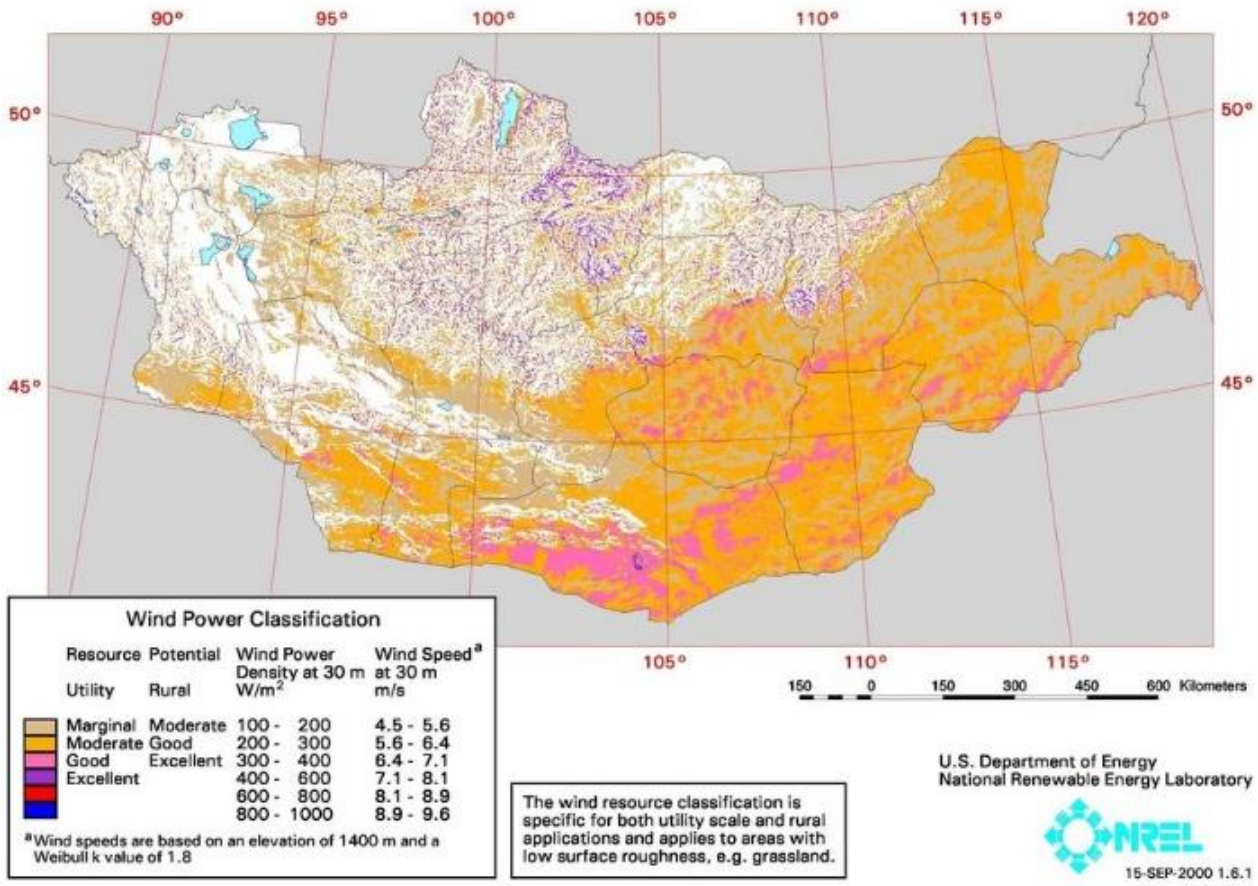
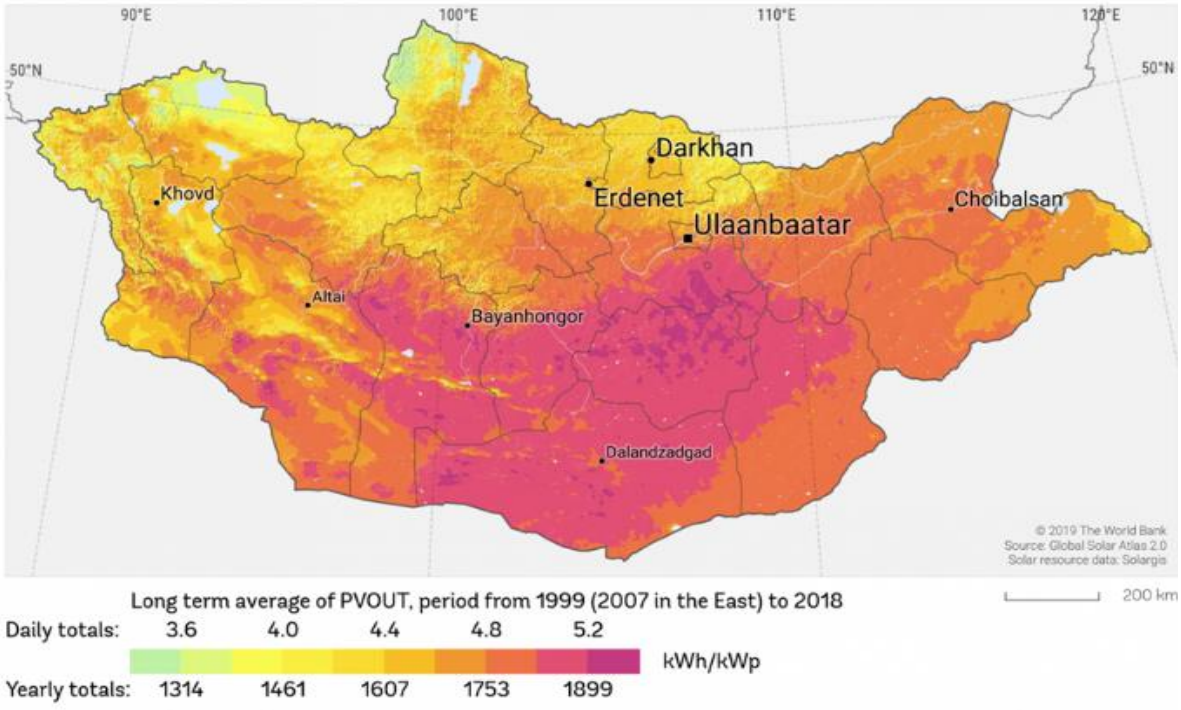


Figure 3-4 Mongolia's solar photovoltaic potential



Source: World Bank ESMAP

In parallel, there is the potential for hydropower. Mongolia's rivers have untapped potential, including both large and run-of-the-river micro-hydropower, which could generate 1.2 to 3.8 TW of clean energy.[13]

Every unit of energy derived from renewable resources builds Mongolia's resilience and energy sovereignty and reduces vulnerability to external energy suppliers and commodity price shocks.

A more diverse economy

Low-carbon electricity, heat and energy efficiency technologies can help diversify the economy and create more jobs. These technologies are related to heat pumps, energy storage, geothermal, biogas, recycling waste to heat energy, green hydrogen, battery storage connected via smart mini-grids, and green and passive housing. This would reduce dependency on a few coal-based industrial sectors, and create more resilient, future-proof employment opportunities. The city government of Ulaanbaatar has already developed a Local Energy Efficiency Action Plan (LEEAP), which has shown promising results in improving the energy efficiency of buildings especially of kindergartens, schools and government buildings in ger area thus creating local-level opportunities. This initiative can be scaled up and expanded to other parts of the country.[14]

The low-carbon transition should also embrace transport, especially in Ulaanbaatar. Buses powered by batteries or hydrogen fuel cells, for example, can dramatically reduce the city's carbon emissions, improving air quality and providing more sustainable transport. Such initiatives can also spur local manufacturing units for hydrogen fuel cells, creating jobs and promoting technological advance.[15]

Sustainable mining of energy transition minerals

Mining operations are notably energy-intensive; roughly 30 percent of total cash operating costs for mining are for energy.[16] Mines have traditionally relied on electricity locally generated from coal, or on imports from China. This reliance on fossil fuels not only increases greenhouse gas emissions but also exposes the Mongolian mining sector to the volatility of imported electricity and fossil-fuel prices.[17]

With advances in renewable energy technologies and their declining costs, mining operations can replace conventional electricity sources with solar and wind energy, and green hydrogen.[18] Incorporating renewables would reduce their environmental footprint and help mobilize funding and investments from environmentally conscious stakeholders and investors.[19]

Just as important, Mongolia can be a major exporter of minerals critical for global renewable energy needs. The country is endowed with an abundance of the necessary natural resources, including copper, fluorspar, lithium, gold, iron, tungsten, molybdenum, uranium, zinc, and 15 rare earth elements.[20] [21] Mongolia can position itself as a provider of the necessary materials and has a 20-to-30-year window to tap into the necessary investment.

Moreover, instead of exporting raw ores, the country should process more minerals domestically. For this it is seeking investment from developed countries.[22] With such investment, the mining sector can achieve significant cost efficiencies, reduce its environmental footprint, and enhance its social responsibility. What is needed is inclusive, people-centred critical mineral development that will also increase livelihood and employment opportunities.

More diverse employment

Compared with fossil- fuel energy generation, clean energy systems can create three times as many jobs for the same investment. Renewable energy, hydropower, and waste-to-energy generation could create up to 7.7 full-time equivalent jobs per $1 million invested, compared to only 2.7 full-time equivalent jobs for fossil-fuel investment.[23] By 2050, compared with the same amount of investment in fossil-fuel energy production, additional investments in a 2 GW solar power plant, 28.8 GW of wind, 2 GW of hydropower, 0.6 GW waste-to-energy, and related value chains could provide 350,000 jobs (Figure 3-5). Investment in renewable energy also has shorter lead times.

Some of the greatest employment potential is in Ulaanbaatar. The city has a labour force participation rate of only 55 percent and an unemployment rate of 5.7 percent.[24] Being the nation's main economic hub and population centre, the city can pioneer initiatives in energy efficiency, smart renewable energy for electricity and heating for suburban settlements, urban greenhouse farming that employ smart grid solutions, and research and development in renewable technologies. Such endeavours can enhance the city's energy security and catalyse a variety of job opportunities.

Figure 3-5 Comparison of jobs created by renewable energy vs fossil fuels

Source: Visualization based on UNESCAP 2024 NEXSTEP Simulations

An SDG7 push will require a holistic approach to job creation and investments in education, skilling, upskilling, and reskilling. The SDG Push diagnostic by UNDP concludes that this would increase productivity, boost GDP, diversify the economy and lift people out of extreme poverty.[25]

Stronger regional development

Harnessing Mongolia's renewable energy potential could help bridge regional employment gaps. By channelling more investments into solar projects in the Western region, especially in Bayan-Ulgii, Khovd, and other provinces Mongolia can create multiple and immediate job opportunities in installation, maintenance and operations, while also fostering long-term skill development in the renewable sector.

Mongolia has a few hybrid renewable energy systems that provide electricity to rural areas, but these are underperforming. The equipment was poorly installed and lacks proper maintenance and suffers from a shortage of skilled labour.[26] This demonstrates the need for high-quality skills development in renewable energy technologies.

Wind energy offers a further avenue for employment. Another Western province, Zavkhan, which has a labour force participation rate of 67 percent,[27] stands to benefit immensely from wind energy projects. Investing in infrastructure can diversify the local job market – from turbine installation, to maintenance, to grid integration, addressing some of the region's immediate employment needs.

Employment will also be boosted by tapping geothermal energy. Mongolia is located on the Central Asian Orogenic belt, and has geothermal energy potential in Bayan-Ulgii, Khovd, Govi-Altai, Khentii, Khovsgul, and Dornod provinces.[28] The greatest potential, however, is in Khangi and Arkhangai provinces.[29] [30] Geothermal investment can spur job creation, ranging from exploration, drilling, and plant operations to maintenance, and can attract labour from other parts of the country.

Renewable energy can provide power for rural SMEs – for example in greenhouses, vegetable processing and pickling, dairy farms, meat processing, frozen vegetable processing, aquaponics, and livestock husbandry. This can provide additional and diversified sources of livelihoods and decent work opportunities in rural areas for herder families.

More opportunities for women

A gender-just energy transition would mean changing cooking and heating methods. This will not only reduce indoor air pollution but also reduce the time and labour burden on women.[31] Liberation from the drudgery of traditional energy chores can unlock a cascade of benefits which include healthier homes, time salvaged from laborious fuel collection that could be invested in education or entrepreneurial pursuits, and an enhanced sense of autonomy and self-worth. A well-executed JET could empower women and vulnerable groups by ensuring equitable access to energy and creating employment opportunities, thereby aligning with broader social goals and international commitments under the SDGs.[32]

Women may also be more attracted to working in a sector perceived to be more socially and environmentally sustainable.[33] Globally, women represent 32 percent of the renewable energy workforce, compared to 22 percent in the traditional energy sector.[34] However, they are typically in administrative and support roles rather than in leadership. With appropriate training and capacity-building, women can venture into technical roles within the renewables sector.

A gender-just energy transition would require education and training programmes tailored to meet the unique needs and challenges faced by women. There could be scholarships or grants for women in energy-related fields.[35] But the Government will also need to work with energy and mining sector actors to ensure they alter their corporate culture to enable women to join and to remain and grow their careers. The recently developed Gender Action Plan for the energy sector should increase women's participation and integrate gender equality. Some

commendable steps have already been taken. For instance, some companies in the energy sector are providing childcare facilities.[36]

Beyond the technical skills, equipping women with entrepreneurial acumen can open doors to clean energy ventures. By facilitating access to microcredit, coupled with mentorship programmes and collaboration platforms, Mongolia can kindle a wave of women entrepreneurs in the energy domain. Whether it is in the form of a local solar cooperative powering a cluster of homes, or a distribution network for clean cooking solutions, these enterprises can be transformative and champion the cause of women's economic autonomy.

IEA's Equality in Energy Transitions Initiative, supported by Canada, Italy, and Sweden, is helping women leaders in many countries in accelerating gender equality and diversity in clean energy transitions.[37]

Empowering migrants and vulnerable populations in ger districts

A just energy transition will benefit internal migrants and vulnerable populations living in the ger districts of Ulaanbaatar. At present they often have to burn coal, which not only harms their health but also adds to discrimination and stigmatization from the rest of the city's population who blame them as the primary air polluters.

The JET should be inclusive, actively involving migrants and other vulnerable people in the decision-making processes. This would make the energy transition more effective by incorporating the lived experiences and specific needs of the migrants and give them a tangible sense of ownership and control over their immediate living conditions.

Such involvement could extend beyond simple consultation to include roles in planning, implementation, and even maintenance of renewable energy projects. A JET would certainly open avenues for technical education and vocational training programmes that could equip workers in suburbs with specialized skills, thereby increasing their employability in a growing industry. This would not only contribute to economic stability but also reduce vulnerability to discrimination and limited access to basic services.

Moreover, a JET could catalyse infrastructure development in soum and aimag centres making these areas more appealing for migrants for long-term settlement. Renewable energy projects could provide local employment opportunities, and the availability of reliable, clean energy could also attract other forms of investment and development, such as schools, healthcare facilities, and small businesses, further enhancing the quality of life.

This could also catalyse the development of more sophisticated and sustainable water and waste management systems, such as water wells, composting toilets, or small-scale sewage treatment facilities, improving both hygiene, sanitation, and public health. The ripple effect of these improvements could extend to other areas of human development, including hygiene, healthcare, and overall wellbeing, thereby reducing the systemic vulnerabilities that migrants face.

A JET would offer a compelling alternative to the overcrowded and polluted conditions in Ulaanbaatar. This would in turn alleviate the population pressure on the capital, mitigating the city's environmental degradation and resource management issues.

Including the vulnerable communities

Energy-related challenges could significantly impact the population living in the 'ger' areas of Ulaanbaatar and other provinces. They do not have access to centralized heat supply – so have to rely on coal stoves for heating.[38] The ger areas are also often in places with limited access to essential road, water, sanitation and energy infrastructure. This not only affects their quality of life but has broader implications for economic development and social integration and overall human development. The lack of adequate energy infrastructure perpetuates a cycle of poverty and marginalization for ger households making them vulnerable, further limiting their economic and social opportunities.

A JET presents a multifaceted solution to these complex challenges. By diversifying the energy portfolio to include renewable sources like geothermal and wind – two high-potential renewable resource in Arkhangai, Ovorkhangai, Khovsgol, Bayan-Ulgii, Khovd, Tov, and Khentii[39] – the regions could not only increase their energy security and energy-related employment, but also attract investments in other sectors, such as tourism and small-scale industries, reducing dependency on animal husbandry while creating employment. The decentralization of energy production could also facilitate the extension of essential services to remote areas, improving the quality of life and potentially reducing the need for economic migration to urban centres.

Involving the regional populations in the decision-making processes of geothermal and wind-based renewable energy projects can empower people economically and socially. Community ownership models or public-private partnerships can give them a stake in the success of these projects, thereby increasing their economic resilience. This participatory approach would not only make the transition more effective but also empower people with new capabilities for human development, giving them a sense of ownership and control over their living conditions. It would also provide them with opportunities for technical education and skills training in the renewable energy sector, thus increasing their employability and reducing their economic vulnerability.

Uplifting herder communities

A JET in Mongolia must also be tailored to meet the specific needs of herders. One such avenue is renewable-powered heating for housing and for energy-efficient sheds for livestock, a concept that builds on the portable solar heating systems now widely available. Such sheds offer dual advantages. First, by employing renewable energy sources and high-quality insulation materials they can maintain stable temperatures for livestock during Mongolia's harsh winters. Second, they can reduce livestock mortality and increase overall productivity. Further, solar power can also be used for hydroponic fodder production throughout the year. This in turn makes herding communities more resilient to market fluctuations and other economic challenges. The revenue generated from healthier, more productive livestock can be reinvested in improving overall human development for herders and thus reversing their migration.

Another avenue is to use renewable energy to produce milk powder, yogurt, curd, and cheese by SMEs. This would not only address the issue of milk waste and logistical constraints but also align with global sustainability goals. In locations with geothermal resources, for example, this can provide hot water for processing plants. Given Mongolia's topographical challenges, localized combined renewable solar energy and geothermal plants could provide energy for processing milk, thus reducing the need for long-distance transportation of raw milk, thereby minimizing waste.

Biogas generated from livestock manure can also be converted into biomethane to fuel combined cycle gas turbines. This is particularly relevant for Mongolia which has abundant livestock manure. For example, In California, biomethane from 60,000 cows can produce enough heat to power a

milk powder plant.[40] The initial capital expenditure for setting up renewable energy systems can be high. However, the long-term operational costs are significantly lower, and the systems can be scaled as per demand. Moreover, the use of renewable energy can make the milk powder production process more sustainable. For herders, the implications are substantial.

The nomadic lifestyle of herders, coupled with the harsh climatic conditions of Mongolia, including extreme winter temperatures, presents unique challenges for the implementation of sustainable energy solutions. These challenges require targeted policy interventions, including government subsidies and grants for de-risking the adoption of renewable energy technologies and investments.

Achieving the Sustainable Development Goals

A JET embodies a comprehensive approach to transitioning towards sustainable energy systems. This aligns with the objectives of SDG 7, which emphasizes access to affordable, reliable, sustainable, and modern energy for all, but also connects with the achievement of various other SDGs.

SDG 7 primarily targets the transformation of the energy sector to meet global energy demands in a sustainable manner. A JET's ambitions are more expansive. They aim to reshape energy production and consumption patterns in a way that is equitable and inclusive, ensuring that the transition process does not disproportionately marginalize any group or put them at a disadvantage. Moreover, a JET's scope transcends the confines of the energy sector. It adopts a holistic approach, integrating socio-economic factors and environmental sustainability with national development goals and environmental conservation.

SDG 1 – A JET addresses poverty reduction by providing new livelihood opportunities in renewable energy production (Target 1.3, 1.6). It would empower women by freeing up their time from chores related to traditional coal-based heating, cooking, health care, and maintaining the household (Target 1.7).

SDG 3 – A JET will combat severe air pollution, which contributes to respiratory diseases and premature deaths. By moving away from coal and biomass to cleaner energy sources, Mongolia can significantly reduce emissions like PM2.5, SO_2, and NOx, (Target 3.4) and reduce deaths and illnesses from pollution (Target 3.9). This could be particularly beneficial in ger districts, where marginalized communities suffer disproportionately from pollution-related health issues.

SDG 5 – A JET would foster gender equality by ensuring women's active participation in energy sector decision-making, aligning with Target 5.5. This involves integrating women and gender experts into policy formulation, making energy policies technically sound and socially equitable. Additionally, it embodies support for reforming women's equal rights to economic resources (Target 5.a), ensuring their equal representation and benefits in the renewable energy sector.

SDG 7 – Target 7.1 would prioritize universal access to clean energy, especially for women managing household energy needs. Mongolia's rich renewable resources, like wind and solar can support Target 7.2 by offering sustainable alternatives to coal dependency. By phasing out aging coal-fired power plants, increasing energy efficiency, and implementing a renewable energy transition, Mongolia can reduce carbon intensity (Target 7.3) and benefit from international cooperation for clean energy technologies (Target 7.A). In upgrading energy infrastructure and adopting modern technologies (Target 7.B), Mongolia can sustain a self-sufficient energy ecosystem.

BOX 3-2 SDG impact matrix

Affordable and Clean Energy

Targets 7.1, 7.2, 7.3, 7.a, 7.b

Universal access to clean energy (especially for women-led households), implement wind and solar renewables, phase out coal, reduce carbon, international cooperation, adopt modern infrastructure and technology

No poverty

A JET will help reduce poverty by providing social protection measures, and equal access to renewable energy technology and resources.

Good health and wellbeing

Combat severe air pollution linked to respiratory disease and premature death, reduce noxious oxides especially in ger districts.

Quality education

Renewable energy heating available for educational facilities. Sustainability and renewable energy-related courses are included in the curriculum, and teacher skills are enhanced for the delivery of these courses.

Gender equality

Ensure women's active participation in decision-making, policy, representation, and economic access within the energy sector.

Clean water and sanitation

Improve clean water access through decentralized energy production.

Decent work and economic growth

Diversify the energy mix, job creation in R&D, growth in agriculture, construction, minerals mining, workforce inclusivity, promote youth development.

Industry, innovation, and infrastructure

Implement renewable energy and associated sustainable infrastructure for industry and households both off-grid and on-grid. Mini-grids and AI-driven smart grids are introduced.

Reduced inequalities

Provide for minority community inclusion and fiscal incentives in energy policy, enhance attractiveness of intermediary soum and aimag centres.

Sustainable cities and communities

Combat climate change, create sustainable urban communities through renewable projects.

Responsible production and consumption

Production of clean renewable energy, conversion of animal waste to renewables through biogas technology, reduce waste, introduce energy efficiency and conservation to reduce energy consumption.

Climate action

Renewable energy technology adoption provides adaptation and mitigation action. Reduce climate-related hazards, integrate climate change in national policies.

For SDG 8 – JET is a key enabler for economic diversification, job creation, and the promotion of decent work. It aligns with Target 8.2 by diversifying the energy mix and creating high-value-added jobs in research, development, and manufacturing. The transition supports development-oriented policies (Target 8.3), stimulating growth in agriculture, construction, and mineral mining sectors critical to the energy transition. It also presents an opportunity for increasing equality in the workforce, focusing on gender equality and inclusivity for persons with disabilities (Target 8.5). The growth of Mongolia's education sector (Target 8.6) is crucial in preparing youth for the green economy, and the shift towards renewable energy promises safer working environments (Target 8.8).

SDG 9 – A JET is vital for building resilient infrastructure and promoting sustainable industrialization (Target 9.4). Retrofitting Mongolia's coal-dependent industrial sector with cleaner technologies is necessary for long-term viability and aligns with global sustainability standards. The focus on renewable energy technologies like solar, wind, bioenergy, and hydropower, and the potential in geothermal energy, are key to sustainable infrastructure upgrades.

SDG 10 – A JET reduces inequalities by empowering and promoting the inclusion of all social groups, especially marginalized communities. Involving minority communities in energy policy decision-making (Target 10.2) and ensuring inclusive policies (Target 10.3) are crucial. Fiscal incentives for renewable energy projects can prioritize marginalized communities (Target 10.4). Enhancing the attractiveness of soum and aimag centres through renewable energy projects contributes to well-managed migration policies (Target 10.7).

SDGs 11 and 13 – A JET is crucial for making cities sustainable and combating climate change. Renewable energy projects and energy efficiency can transform Ulaanbaatar into a sustainable urban centre (Targets 11.2 and 11.6). The shift to cleaner energy sources reduces emissions and strengthens resilience to climate-related hazards (Target 13.1), while integrating climate change measures into national policies (Target 13.2) would reinforce Mongolia's role in global climate action.

Moreover, a stable energy supply would strengthen access to basic amenities including education (SDG 4), water (SDG 6), and waste management (SDG 12) with a focus on enhancing educational facilities (Target 4.a). Decentralized renewable energy production will improve access to clean water (Target 6.1), and biogas technology converts animal waste into renewable energy, reducing waste generation (Target 12.5). These advances are crucial for Mongolia's progress towards achieving interconnected SDGs, addressing environmental, social, and economic challenges.

The benefits for human development

A well-planned and just energy transition can make a strong contribution to human development. The potential benefits are summarized in Box 3-3 which shows how the JET would deliver through social, economic, and environmental channels. The just energy transition could reshape Mongolia's energy landscape and contribute to human development beyond 2030 by reducing harmful emissions, phasing out coal, transitioning to sustainable mining, and creating diverse economic opportunities.

BOX 3-3 JET and human development

HD dimension	JET impact
Long and healthy life	Less air pollution to reduce the risk and rates of disease, cancer, and reduced lung capacity.
Knowledge	Increased opportunities for STEM education and for technical and vocational skills development, and training for green energy production and infrastructure. Development of new technologies, economic growth in energy, services, agriculture, construction, industry, and mining.
Decent standard of living	Divest from coal to invest in learning or other green economic opportunities. A more comfortable and safer living environment with cleaner air, especially for ger district households.
Political and community participation	There could be political polarization and instability in the initial years. But in the long run, a JET would increase representation of minority communities in policy decision-making and allow individuals greater agency in their lives by including them in a sustainable transition.[41]
Environmental sustainability	Reduction of greenhouse gas emissions.
Human security and rights	While in transition there could be setbacks for some workers, however, in the long run a well-orchestrated JET increases the ability of communities to live safely and securely in a clean and healthy environment.
Gender equality	A JET would free up time for women and girls from unpaid care work and from time consumed in fossil fuel-based heating and cooking activities. Time saved could be used to pursue learning, skills development, and economic opportunities in the formal labour force.

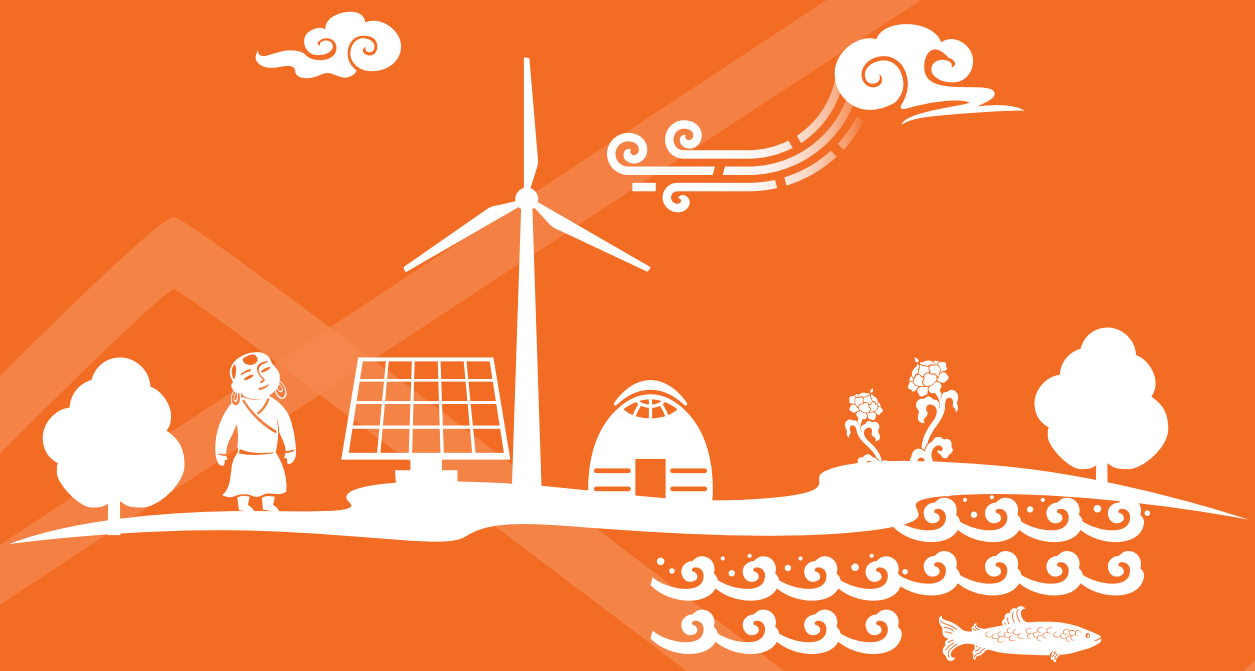
A JET thus offers Mongolia the prospect of economic transformation and building on the foundations of human development (Box3-3). But there is a long way to go. The next chapter considers the policies and plans that will be needed for a JET to truly take off.

Endnotes and references

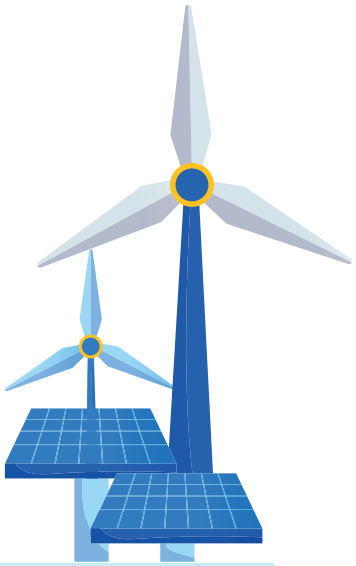
1 (Herberg, et al., 2023)..
2 (UNDP, 2023)
3 (GoM, 2020).
4 (Kirkland and Poppleton, 2021)
5 (ICEF, 2019).
6 (K.Amina, 2017).
7 (Bayasgalankhuu, Ilahi, Wei, & Wu, 2022).
8 (Van Der Kooij, Zwarteveen, Boesveld, & Kuper, 2013, pp. 103-110).
9 (Bayasgalankhuu, Ilahi, Wei, & Wu, 2022).
10 (IRENA, 2016)
11 (IRENA, 2016) and (ADB, 2020b)
12 (IRENA, 2023a).
13 ibid
14 (GIZ, 2020a)
15 (Nilsson, et al., 2021).
16 (Deloitte, 2017). At 2015 constant prices
17 (Igogo, 2020).
18 (Igogo, 2020).
19 (Deloitte, 2017).
20 (IEA, 2023a).
21 (Mongolian Economy, 2020).
22 (Rosario, 2024).
23 (ESCAP, 2024).
24 (NSO, 2024a).
25 (UNDP, 2023e)
26 (Tamir, 2015).
27 (NSO, 2024a).
28 (Bignall, 2005).
29 (Ganbat, 2010).
30 (IRENA, 2023a).
31 (UN Women & UNIDO, 2023).
32 (UN Women & UNIDO, 2023).
33 (Weinreb, 2013).
34 (IRENA, 2019).
35 (Ngum & Kim, 2023).
36 Sambuunyam, 2023.
37 (IEA, 2024).
38 (IRENA, 2023a).
39 ibid.
40 (Walmsley, Walmsley, Atkins, & Neale, 2016).
41 According to UNDP, 2024a and The Rockefeller Foundation, 2024 populace Is polarized and have divergent views on climate transformation. Inequality and polarization are increasing due unjust distribution of resources and lack of people's agency, undermining democracy, which is destabilizing the world.

CHAPTER 4.

A JUST ENERGY TRANSITION IN ACTION



A JUST ENERGY TRANSITION IN ACTION



Clean energy transitions would create decent jobs, improve the quality of life, and create a healthier environment. By focusing on skills, worker protection, social equality, and active participation, Mongolia can distribute the benefits and costs fairly among all actors, employing a whole-of-society approach.

Mining has received the highest priority for investment in the last two decades, and an overconcentration on mining has diverted investment and labour away from other sectors.[1] From a human development perspective, a JET can take advantage of natural resources while prioritizing people, inclusivity, fairness, and protection of the most vulnerable. Such a transition is essential for addressing climate change. Inaction is not an option.[2]

This section draws on the preceding discussion and on stakeholder consultations to suggest policy actions and feasible recommendations. While tailoring its own solutions, Mongolia can learn from global experiences.

Global trends and lessons in energy transition

In 2021, the IEA convened a Global Commission for People-Centred Clean Energy Transitions, which issued recommendations for the COP26 meeting in Glasgow in 2022. The Commission called for decent work protection, social and economic development, and greater equity, inclusion, and fairness with active involvement of all stakeholders, especially the most vulnerable populations and the younger generation (Box 4-1).

The COP 26 discussions resulted in the formation of the first of a series of just energy transition partnerships (JETPs).[3] These intergovernmental partnerships coordinate financial resources and technical assistance for climate action in carbon-intensive developing countries. Initially they supported decarbonization in South Africa and Indonesia but have since been expanded to other countries in Asia and the Pacific including India and Viet Nam. The pool of financing countries and institutions has also expanded and now includes multilateral development banks, national development banks, and development finance agencies. In Indonesia, the JETP aims to decarbonize the energy and industry value chain; in Viet Nam, it covers both the energy and transport sectors.[4] Mongolia can learn from these experiences and align JET strategy frameworks with Nationally Determined Contributions (NDCs) and Long-Term Low Emission Development Strategies (LT-LEDs).

BOX 4-1 Recommendations of the Commission on People-Centred Clean Energy Transitions

The Global Commission on People-Centred Clean Energy Transitions was an independent panel of 30 members convened by the IEA Executive Director to produce recommendations in advance of COP26 in 2021. Its recommendations included:

Decent jobs and worker protection

1. Design transitions to maximize the creation of decent jobs.
2. Develop tailored government support for communities and workers while focusing on skills and training.
3. Use social dialogue, robust stakeholder engagement, and policy coordination to deliver better outcomes.

Social and economic development

4. Ensure that policies enhance social and economic development and improve the quality of life for all.
5. Prioritize universal clean energy access and the elimination of energy poverty.
6. Maintain and enhance energy security, affordability, and resilience.

Equity, social inclusion, and fairness

7. Incorporate gender equality and social inclusion considerations in all policies.
8. Ensure a fair distribution of clean energy benefits and avoid disproportionate negative impacts on vulnerable populations.
9. Integrate the voices of younger generations in decision-making.

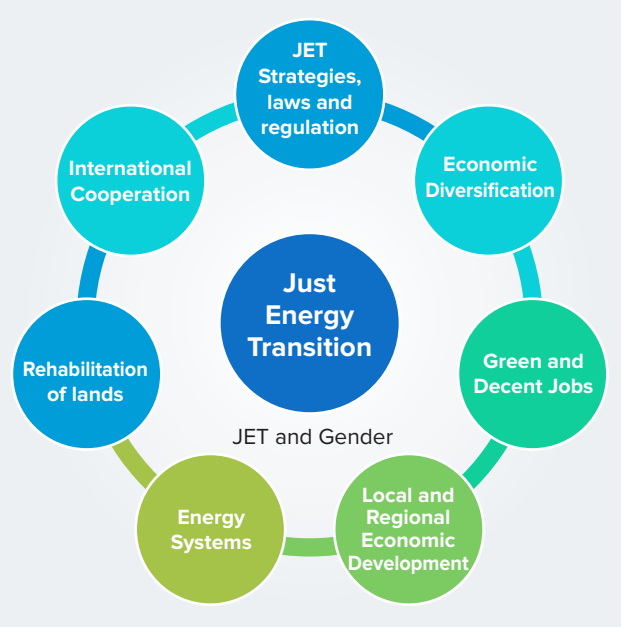
People as active participants

10. Involve the public through participation and communication.
11. Use insights from behavioural science to design policies for behaviour change.
12. Enhance impact through international collaboration and exchange of best practice.

Source: Global Commission on People-Centred Clean Energy Transitions[5]

Since 2008, the German government has led the International Climate Initiative (IKI) and the European Union has co-funded "Innovation Regions for a Just Energy Transition" to help coal regions transition from coal to sustainable sources of energy. The IKI JET project is being implemented in seven coal regions across the globe, namely Chile, Colombia, Indonesia, South Africa, Thailand, Viet Nam, and Mongolia (recently). The main objective of the intervention is to support and accelerate the transition away from coal to renewable energy and other sustainable economic activities. In Mongolia, the project is being implemented in Nalaikh district, where a JET Strategy is being developed by the district government which has incorporated it into its 2024-2028 action plan.[6]

Figure 4-1 JET dimensions



Source: Adapted from IKI JET

Based on these global experiences, a JET in Mongolia could encompass elements in at least eight dimensions for accelerating the transition process expressed schematically in Figure 4-2.

JET Strategies as a participation mechanism – A comprehensive JET strategy with supporting regulation and policy framework is a necessary first step to address the challenges and opportunities for and energy transition.

JET for economic development and diversification – Solar, wind, geothermal, green hydrogen, and water energy solutions would revolutionize mining, industrial processing, and manufacturing, and boost support for SMEs in agricultural food processing. A 10MW-model solar power plant in the Songinokhairkhan district of Ulaanbaatar powers smart greenhouses for farming and provides electricity to 23,000 households.[7] Such initiatives have immense potential for redesigning agricultural processing, diversifying the economy, and improving job opportunities and human development outcomes in remote provinces.

JET for decent jobs and social protection – Any energy transition strategy must include a skills development and reskilling programme to train people for the emerging economic opportunities. Besides, building the skills of workers who lose their jobs due to transition is also necessary in the short term. Thus, JET skills development and re-skilling programmes would increase human development outcomes for all vulnerable groups.

JET for a cleaner environment and lower emissions (local community development) – The green energy transition will create economic diversification and entrepreneurial opportunities at a local level. This will reduce air pollution, thus improving air quality year-round while cutting carbon emissions. Renewable energy can power clean water and sanitation and waste management systems while also providing heating for kindergartens, schools, hospitals, and other facilities. Clean electricity and heating could free women, girls, and youth to participate in education or the labour force – increasing per capita incomes and improving human development outcomes.

JET for energy systems – The transition in energy systems necessitates a shift from fossil fuels to alternative and renewable energy systems to power the economy. This will open up opportunities for technology development, adaption, and technology transfer among countries for adaptation thus accelerating mitigation and adaptation action.

JET for coal phase out – As the world adopts green energy systems the demand for coal will decrease. At COP 28 the world has agreed to work towards transitioning away from coal by 2050. Around the world coal mines that have closed need to be cleaned up and rehabilitated. Similarly, the coal power plants that are transitioning need to be re-purposed towards renewable energy production and distribution.

JET for gender equality – Gender is a cross-cutting area across all JET dimensions. A JET would enable more women to participate in management and decision making. In Bayanzurkh district of Ulaanbaatar, for example, the local government in partnership with UNICEF is using an integrated early childhood development model that enables women to enter the labour force.[8] According to the

Ministry of Education and Science, 28 businesses, including energy companies, have introduced on-site kindergartens for the children of employees.[9]

JET as an international partnership – A JET requires a comprehensive cross-sectoral framework, a robust financing mechanism, related institutional development, and future-fit governance.

Policies for a JET in Mongolia

Mongolia faces considerable barriers to a renewable energy transition. Renewable energy systems that are not compatible with existing grid network infrastructure threaten instability and uncertainty in terms of policy and strategic foresight beyond 2030. The country also has limited capacity to attract financing and lacks much of the technical knowledge and skills related to renewable energy. The population is now more aware of the value of renewables and has a greater understanding of its potential in economic diversification, yet there are barriers to adoption. These could be addressed through policy and regulatory environments favouring energy efficiency, energy conservation, and a fossil-fuel transition. In addition, there are gender disparities related to energy access.[10]

These hurdles are by no means insurmountable and can be tackled systematically. Box 4-2 summarizes policy options and timeframes. The most important step is developing a people-centred JET Strategic Framework, with a net zero 2050 focus, and a related JET financing framework and investment action plan. GIZ, for example, has supported the development of a just energy transition strategy by the district of Nalaikh which could offer lessons for other districts.[11] The new Government is however, developing a new energy transition plan as part of the New Action Program 2024-2028, which will likely address some of the key issues.

BOX 4-2 JET-related policy options and timeframes

Policy Intervention	Short-term	Medium-term	Long-term
Strategic institutional and governance measures 	• Development of JET strategy and action plan. • Coal phase-out plan for ger districts. • Create inclusive space for dialogue, and adopt co-creation approaches and transparency.	• Promote effective coordination among different stakeholders within the public and private sectors. • Build leadership capacity. • Decentralize and liberalize energy production and distribution. Transition from the single buyer and seller to a multiple buyer and seller market. • Increase the role of the private sector in energy governance. • Implement future-fit governance. • Implement independent audits, accountability, anti-corruption, and risk management of a JET.	
Legal, regulatory, and standardization measures 	• Review and update energy regulations and laws. • Introduce a mini-grid regulatory framework. • Develop carbon credit mechanism framework and emissions trading systems.	• Revise energy efficiency and energy conservation standards and implement gradually. • Setup mechanisms for verification, validation, and implementation of energy efficiency standards across the country. • Develop monitoring verification and reporting (MRV) systems for the energy sector. • Develop and introduce a best energy alternative technology (BEAT) framework.	

Policy Intervention	Short-term	Medium-term	Long-term
Energy infrastructure 	• Support renewable energy and energy efficiency solutions for households and SMEs in the ger areas of Ulaanbaatar as well as aimags.	• Develop off-grid and on-grid renewable energy and mini-grid solutions/ infrastructure. • Develop green housing, expanding off-grid renewables. • Upgrade the national grid and distribution network. • Implement renewable energy and hydroelectric projects. • Undertake green energy-efficient housing and transport infrastructure development.	
Sustainable finance 	• Develop JET financing framework.	• Promote blended climate finance for financing energy transition projects, including renewable energy and energy efficiency.	
Fiscal policy 	• Results-based budgeting in JET sectors of the economy. • Revise the carbon taxation framework.	• Gradual introduction of carbon taxes. • Gradual phase-out of coal and energy subsidies to build a fiscal surplus, for de-risking renewable energy and financing social protection.	• Implement carbon taxes in all sectors. • Create fiscal space for financing green energy and attracting FDI.
Economic measures 	• Socio-economic analysis including social accounting matrix modelling, and social protection mapping surveys. • Increase tariffs with a phased approach for full cost recovery. • Fair negotiation of energy and JET contracts. • Operationalize mechanism for renewable energy auctions to benefit from lower production prices.	• Support de-risking of renewable-energy investments by redirecting subsidies to households and businesses towards adopting renewable- energy solutions.	• Promote investment in sustainable critical energy transition minerals mining.

Policy Intervention	Short-term	Medium-term	Long-term
Innovation 	• Invest in research, innovation, and develop local energy solutions, e.g. energy-efficient insulation from local materials	• Introduce demand-side programmes for improving energy efficiency to lessen the impact of tariff increases. • Build modern smart AI grid management infrastructure in cities. • Introduce and manage smart energy infrastructure for a nationwide grid.	
Social Protection 	• Provide targeted social protection measures to vulnerable households impacted by tariff increases.	• Introduce future skills and cash-for-work for displaced workers	
Skills of future 	• Skill mappings of vulnerable sectors affected by a JET. • Design a national qualification framework for emerging skills and formulate training programmes.	• Skills training and employment placement programmes for youth and women in the emerging sectors of the economy. • Retrain people who lose their jobs.	
Empowerment 	• Integrate vulnerable groups in decision making and project planning, especially women, youth, and those who would be affected by a JET. • Introduce and step-up behavioural change programmes.	• Promote social entrepreneurship for energy efficiency and energy conservation.	
Behavioural change communication 	• Introduce behavioural change communication and public awareness programmes with respect to renewable energy, fossil-fuel phase out, energy efficiency and conservation, and targeted social protection.	• Assess the impact of communication and behavioural change programmes and update the messages based on communication needs.	
International cooperation 	• Support dialogue for breaking cooperation gridlocks. • Attract foreign direct investment.	• Support COP28 implementation of commitments on tripling renewables and develop a fossil-fuel phase-out net zero plan.	• Export energy to neighbouring countries.

Legal and regulatory reforms

Legislation will be needed to align domestic laws and policy actions with global commitments made in the NDCs related to energy emissions reduction. The newly elected Government has established a parliamentary subcommittee to focus on energy-sector reforms, including a review and amendment of energy laws, energy tariff increases, and issues related to energy finance and governance.

Review Renewable Energy Law – The Renewable Energy Law was amended in 2019 to regulate renewable energy generation, tariffs, and licences. This law would benefit from a comprehensive review to reflect the changing energy landscape and remove legal barriers for the development and adoption of just and clean energy solutions. An update of the law can, for example, resolve issues on feed-in tariffs and consumer energy prices. Instead of determining tariffs by law, Mongolia can invite renewable energy producers to open auctions to benefit from competitive energy production price offers.

Assess environmental impacts – Achieving net zero energy solutions will require enhanced environmental and social impact analysis and 'best alternative technology' frameworks for increasing energy efficiency and reducing carbon footprints.

Emissions trading – Develop high-quality systems for carbon credit monitoring, reporting, and verification (MRV) system for the energy sector along with institutional mechanisms, including emissions trading systems. It is recommended to introduce carbon taxes to divert businesses away from 'business as usual' and make it more attractive to adopt new low-carbon technologies.

Diversify local energy markets – Mongolia's energy industry is highly regulated, with a single, state-owned buyer and seller, which limits the incentives for private investors. Instead, at the local level private investors could establish distributed mini-grids for renewable energy production, storage, and distribution – with multiple buyers and sellers. This requires appropriate regulations and investment incentives, including tariff frameworks for energy generation, sales, and consumption. Mongolia can benefit from experience from around the world, especially from Africa, where renewable energy systems allow households to form cooperatives and become energy producers and consumers (prosumers).[12]

Phasing out fossil fuels and redirecting subsidies

One of the most disruptive policy actions will be to diversify the energy mix to produce less electricity from coal. The Government has committed to having renewable sources provide 30 percent of energy by 2030. Achieving net zero by 2030 will require a higher target.

Remove fossil-fuel subsidies – Consumer prices are too low to cover the cost of energy production and supply at the last mile. As a result, in 2022 Mongolia had to provide $16 million in subsidies for energy generation. These subsidies are not only costly but also regressive since they offer more to the best-connected customers with higher consumption levels. While the Government has increased electricity tariffs for large businesses, it has kept the prices low for SMEs and consumers. According to the Energy Regulatory Commission (ERC), the Government is planning to introduce a progressive, time-of-use, tariff system for household electricity consumers and also increase prices for heat.[13] But its structure is not clear, so it is recommended that the ERC share the tariff revision plans with stakeholders and hold public consultations.

Reduce the risk for transformation investment – Subsidies would need to be redirected to encourage energy efficiency and the use of renewables. In Canada, for example, the Government provides consumer subsidies to cover part of the cost of energy efficiency measures and of introducing geothermal heat pumps.[14] In Mongolia, XacBank, supported by the Green Climate Fund, has conducted a feasibility study which concludes that households in ger areas could afford solar photovoltaic if they had a 50 percent subsidy as a cash grant. Similar initiatives are being implemented in Kazakhstan.[15]

Economic diversification

Producing and processing critical minerals – Mongolia is endowed with deposits of rare earth elements, as well as copper, lithium, and uranium – which are crucial for renewable energy supply chains. Critical minerals can be mined without compromising sustainability. But there needs to be a comprehensive strategy for financing the mining sector and ensuring that the gains from the renewable energy transition reach Mongolia's vulnerable people. Mongolia has a sovereign wealth fund, the Future Heritage Fund, which is accumulating mineral revenues for long-term savings. Mining and exploration proceeds have contributed to the Fund and could finance net zero initiatives and a JET beyond the Fund's maturity date in 2030.

Expand off-grid renewable energy – Renewable sources for electricity and heating can be scaled up to support economic diversification in rural greenhouse farms, animal sheds, cashmere processing, and dairy and meat processing enterprises. Strategically targeted public investments can encourage solar and wind energy for rooftops, ger area housing, and agriculture, and SMEs in remote rural areas. This will create more decent jobs, not only in the renewable energy supply chain but also in agriculture and in food and other processing.

Sustainable finance

A JET financing framework – Mongolia has a well-developed Integrated National Financing Framework, an SDG financing framework, and an SDG Taxonomy, which can serve as basis for a JET financing framework and climate finance to support public- and private-sector ventures in energy efficiency and renewable energy. Based on government contributions, public-private partnerships can unlock sustainable blended finance for renewable energy investments. For example, since 2013, UNDP has supported a Derisking of Renewable Energy Investment programme which has provided innovative and quantitative frameworks to assist policy makers in Belarus, Cambodia, India, Kazakhstan, Lebanon, and Tunisia to deliver wind and solar energy solutions for households and SMEs.

Innovations

Energy efficiency – There is a need to establish an eco-system for energy efficiency, which includes revising and localizing energy efficiency standards, including their verification, validation, and implementation at local level across the country. The Government can also set an example by adopting energy efficiency standards and implementing best practices in improving energy efficiency in public buildings and infrastructure. It can also offer energy rebates to incentivize building owners in new urban developments to achieve minimum energy standards, and gradually

extend this to owners of older buildings. Other encouragement for renewable energy adoption and innovation would include energy audits, with rewards for energy efficiency and announcing NetZero champions. Other low-hanging fruit include electrification of heating and transport sectors and powering public transport with hydrogen which would offer business opportunities in providing energy efficiency audit services, equipment, and materials, and in establishing public charging stations, as well as fuelling stations for hydrogen-powered public and private vehicles.

Modern smart grids and distribution networks – Regulations for a future-ready electricity grid energy system that can use AI for automated load management and net metering should accommodate 'prosumers' who produce, consume, and sell electricity in a distributed network. This will mean revising related policies and regulations and carrying out reforms than encourage private-sector investment. This also requires upgrading the energy infrastructure systems, either on a 'build and transfer' model or a 'build, own, and operate' model, which would attract multiple private buyers and sellers.[16]

Labour market and skills development

The adoption and localization of newer energy transition technologies, including renewable energy, battery storage, hydrogen fuel, pumped-storage hydroelectric power plants and hydro power plants require trained manpower. A well-designed skills framework will be needed to boost labour force participation and reduce labour displacement and unemployment. This should be based on skills mapping and gap assessments – to develop and target skill acquisition programmes especially for women and vulnerable populations, including minorities, youth, migrant workers, and people with disabilities. Skills acquisition can be encouraged for women, youth, and other vulnerable groups through innovation challenges and energy hackathons.

Social protection

To lessen the negative impact of the JET, comprehensive social protection measures must be introduced to provide a safety net for those who suffer job losses and vulnerable households that would face increased pressure from energy price shocks. These measures should be specifically tailored for women – who are at the forefront of energy transition due to their core role in care work at household level.

This requires mapping beneficiaries and adversely affected people and groups and designing policy actions and measures to support the transition in different sectors of the economy. It will also be important to establish key performance indicators and track impacts on various stakeholders including vulnerable populations especially youth, women, and minorities. A people-centred approach for mapping would allow space to tailor policy interventions to meet the expectations of beneficiaries.

Mapping the affected sectors and value chains will involve social accounting matrices for developing policies and social protection measures to lessen the negative impacts on investors and labour force.

The transition should be accompanied by measures that support displaced workers and other vulnerable groups as they integrate into a green economy. These measures could be financed by redirecting harmful subsidies towards targeted skills development and cash-for-work programmes and the provision of childcare support. Specific measures will be needed for vulnerable workers particularly in the provinces that have the lowest labour force participation rates.

Inclusivity and gender equality

Very few women hold leadership positions in public energy institutions and regulatory agencies. Women could, however, have greater agency and participation in JET policy and decision-making. The National Committee on Gender of Mongolia has an expert team for the energy sector which will need capacity building if it is to ensure that women have opportunities on a par with their male counterparts. This should be supported by gender-responsive budgeting. Other public programmes can increase women's participation in the economy, especially in accessing clean energy.

Women need to participate as active beneficiaries of energy transition programmes. This requires dismantling gender stereotypes, raising awareness, and increasing women's voice and agency in management and decision making. Women also need to benefit from formal and informal STEM education and training, and from reskilling and upskilling. Women can join in income-generating and livelihood programmes and in carbon credit markets, as they would be able to sell and trade carbon credits generated from household solar energy production.

Civic engagement, awareness, and communication

Retiring coal would put sunk investments at risk, so there will be pushback from fossil-fuel lobbies. Everyone who has a stake in the energy transition should be treated in a fair and just manner. Recent developments emerging from the Coal Asset Transition Accelerator have indicated that early retirement of newer coal power plants is less costly.[17]

A fossil-fuel phase-out needs to be supported by an engagement and communication plan that addresses the concerns of all stakeholders. This will require public consultations and communication programmes. The aim should be to bridge divided opinions and construct inclusive partnerships based on open dialogue, fair negotiation, and consultation mechanisms to build consensus.

There is a need to increase public awareness on likely cost recovery of heating and electricity services and the fossil-fuel phase out, as well as on energy efficiency and conservation issues. Behavioural change communication and public awareness programmes can address renewable energy, fossil-fuel phase out, energy efficiency and conservation, and targeted social protection. Over the long run, it will be important to assess the efficiency and impact of communication and behavioural change programmes and update the messages based on communication needs.

Future–fit governance

To overcome energy production and distribution challenges Mongolia will need 'future-fit' energy governance. This should ensure transparent oversight, improved integrity, and sound mechanisms for accountability and inclusivity. To ensure that the Government delivers for everyone, especially women, the Energy Regulatory Commission and other energy-related institutions should have women in leadership and decision-making roles – which would improve their wellbeing and ensure that the energy transition is managed well.

Institutions and activities need to be based on transparency and openness – for example, in project contracts, negotiation, and oversight mechanisms. Where there are conflicts, these should be resolved through independent, open, and fair arbitration systems with solutions recommended by the ombudsman and the Justice Department.

Public servants will need capacity building for formulating JET policies and deploying change management mechanisms. This would apply,

for example, within the Ministry of Economy and Development, the Ministry of Energy, the Energy Regulatory Commission, the Ministry of Environment and Climate Change, and other relevant stakeholders and regulatory agencies. With inclusive strategic actions, these ministries can tackle energy demand and supply challenges and build sustainable and resilient energy systems.

International cooperation

Climate change is a global problem with cross-border spillover effects that require international action. Countries can work together on climate mitigation and adaptation to unlock opportunities for integrated cooperation at multiple levels. To tackle environmental threats the global Human Development Report, *Breaking the Gridlock: Reimagining Cooperation in a Polarized World* recommends applying a global public goods lens.[18] Countries can benefit from global expertise and the latest advances in low-carbon technologies, and devise strategies for mobilizing finance for de-risking renewable energy investments.

Attracting foreign direct investment and international cooperation will mean removing regulatory hurdles in the renewable energy sector and its value chain – with a comprehensive plan that integrates both supply and demand management to ensure a balanced and sustainable energy system. A strategically designed JET framework would enable Mongolia to share its renewable energy compact at a global level.

Avoiding transition risks

A JET is a major undertaking and at times will be difficult and contentious. If not well planned, the process could lose its integrity causing stakeholder mistrust and delays, and a reversion to 'business as usual'. The process should be accompanied therefore by continuous efforts at risk identification and mitigation. Risks include:

Regulatory risks

- Laws and regulation that do not keep up with the latest technology and global commitments, impeding progress towards net zero by 2050.

Governance risks

- Lack of foresight results in a weak energy transition framework that overlooks the needs of sectors and stakeholders and lacks forward-looking planning.
- Lack of integrated urban planning and outdated energy systems result in frequent blackouts during the winter months and extreme cold-weather conditions.
- Lack of financial planning would result in resource gaps for meeting NDC targets as well as JET commitments.
- Failures in climate budgeting and planning could underestimate Mongolia's share of the global carbon budget and pipeline investments, thus putting investment and collaboration plans at risk of underinvestment.
- Lack of leadership and future-fit governance slows the implementation of JET.

Political economy risks

- Energy transition reforms backfire and result in internal domestic conflict and violence.
- Lack of economic diversification and resilience-building measures could make future generations of Mongolians more vulnerable to climate crises and uncertainties.
- Inaction regarding energy transition-related climate adaptation and mitigation could result in missed NDC targets, with reputational loss for the Government.
- Accepting climate change as a new normal would increase the risk of government and public inaction and could cause increased risk of loss and damage to property, livestock, and human life and health.

Social risks

- For jobs in traditionally female-dominated employment sectors such as manufacturing and textiles, women could be pushed out by men displaced from other sectors.
- Job losses for men in fossil-fuel sectors could make women the main breadwinners. Traditionally, women are in the low-skill, low-wage service sector. They would thus need to juggle their jobs with their traditional family care roles.
- Domestic conflicts and violence may also surge as a result of energy transitions, either as a consequence of the financial difficulties and frustrations experienced by those who have been laid off, or by the shift in household dynamics as women enter the labour force and increase their agency.
- Social protection systems need to be ready to respond to these challenges, including the provision of psychological counselling for men who are laid off, putting focus on gender-based violence prevention.

Global cooperation risk

- A global gridlock in cooperation among developed nations and the developing countries may impede foreign direct investment and technology cooperation for energy transition. Thus, global inaction may impact Mongolia more than ever.

Table 4-1 Key JET risks and mitigation measures

Dimension	Risk	Mitigation
Regulatory risks 	• Outdated or lack of adequate laws and regulations impede progress on JET.	• Build political consensus and develop new laws and regulations in a timely manner.
Governance risks 	• Lack of foresight and institutional capacity reinforces the status quo. • Lack of financial planning would result in resource gaps for meeting NDC targets as well as JET commitments. Failures in climate budgeting and planning could underestimate Mongolia's share of the global carbon budget and pipeline investments, thus putting investment and collaboration plans at risk of underinvestment. • Lack of leadership and future-fit governance slows the implementation of JET	• Develop foresight capacity for green energy transitions. • Adopt climate planning and budgeting and support climate mitigation and adaptation action. • Build the capacity of public servants in future-fit governance
Political economy risks 	• Energy transition reforms backfire and result in internal domestic conflict and violence. • Lack of economic diversification and resilience-building mechanisms increase climate change impacts. • Inaction regarding energy transition-related climate adaptation and mitigation could result in missed NDC targets, with reputational loss for the Government. • Accepting climate change as a new normal would increase the risk of government and public inaction and could cause increased risk of loss and damage to property, livestock, and human life and health.	• Ensure energy social protection measures are in place to compensate for the negative impact of energy sector reforms. • Develop timely analysis and feedback into economic policy making. • Gradually shift subsidies from fossil fuels and use for derisking renewable energy. • Raise public awareness on climate change and just energy transition challenges through behavioural communication and programmes.
Social risks 	• Conflict among beneficiaries and parties adversely affected by the JET. • For jobs in traditionally female-dominated employment sectors such as manufacturing and textiles, women could be pushed out by men displaced from other sectors.	• Map affected JET sectors and develop an investment and labour force intersectoral migration plan. • Develop labour force skills training and re-training programme tailored to specific job losses in different sectors of the economy.

Dimension	Risk	Mitigation
Social risks 	• Job losses for men in fossil-fuel sectors could make women the main breadwinners. Traditionally, women are in the low-skill, low-wage service sector. They would thus need to juggle their jobs with their traditional family care roles. • Domestic conflicts and violence may also surge as a result of energy transitions, either as a consequence of the financial difficulties and frustrations experienced by those who have been laid off, or by the shift in household dynamics as women enter the labour force and increase their agency.	• Social protection systems need to be ready to respond to these challenges, including the provision of psychological counselling to men who are laid off and putting focus on gender-based violence prevention.
Global cooperation 	• A gridlock in global cooperation impedes foreign direct investment and technology cooperation for energy transition.	• Develop capacity of the Government to access international finance for loss and damage and climate change adaptation. • Increase dialogue with global partners and introduce an investment-friendly eco-system.

The new Government is however, developing an energy transition plan as part of the New Action Program 2024-2028. This should address some of the key issues. The action programme will focus on developing the Western region as an energy-diversified zone, 20-minute smart cities, economic diversification and liberalization, and climate change-focused green financing. It will also establish the importance of human development for building momentum for a just energy transition.

A human development imperative

A just energy transition is not just a matter of energy policy or climate mitigation. For Mongolia it is a human development imperative that has far-reaching consequences for the nation's public health, economic resilience, social equity, and environmental sustainability. The current energy choices, heavily reliant on coal and external sources, have not only degraded the environment but also cause significant public health risks.

A people-centred JET, based on the principles of human development, would cut dependence on coal and boost levels of health, education and skills – and provide decent and greener work opportunities for women, youth, minorities, and vulnerable populations. A JET has enormous potential for creating local demand fuelled by innovation and the basis of a more resilient economy.

Moreover, Mongolia could be at the forefront of global renewable energy development – not only mining and processing materials essential for sustainable energy equipment but also using artificial intelligence across the value chains for food and cashmere processing. Energy policy reforms are primarily important for achieving energy self-

sufficiency. At the same time, however, integrating the JET with global energy demand would position Mongolia as a regional leader in renewable energy exports.

A JET aligns with Mongolia's constitutional principles and harmonizes with its commitments to the SDGs and should be at the heart of a comprehensive strategy for human development.

Endnotes and references

1 World Bank, 2022d.

2 IEA, 2021a.

3 The JETP emerged from discussions at COP26 in Glasgow, where South Africa was promised USD 8.5 billion in financing by France, Germany, the United Kingdom, the United States, and the European Union. Since then, the JETP has expanded to include countries like India, Indonesia, Vietnam, and Senegal. The JEP financing pool of countries has also expanded and now includes multilateral development banks, national development banks, and development finance agencies Kramer, 2022.

4 Kramer, 2022.

5 IEA, 2021a.

6 (IKI JET, 2023)

7 K. Amina, 2017.

8 Unurzul, 2019.

9 Sambuunyam, 2023.

10 (ADB, 2022a).

11 (GIZ, 2024)

12 GIZ, 2022.

13 (ERC, 2023c)

14 (Government of Canada, 2024)

15 UNDP, 2018a.

16 Please refer to (UNDP, 2013; UNDP, 2018a).

17 (Nedopil, 2024).

18 UNDP, 2024b.

CHAPTER 5.

ANNEXES

ANNEXES

Annex – Data sources and indices

This report is based on a broad literature review combined with extensive online and other consultations with stakeholders, including representatives from the public sector, private industry, and development partners (Annex – IV).

Data for the human development index and related composite indices come from the Human Development Report Office. Energy data come from published and unpublished sources available from the National Statistical Office and the Energy Regulatory Commission as well as the International Renewable Energy Agency. The report also uses numerous secondary data published by UNDP Energy Hub, UNDP Data Futures, UN Energy, UNESCAP, the European Union, Our World in Data, the World Bank Indicators, Asian Development Bank, and the IMF.

The infographic below presents the UNDP human development framework and its measuring matrix, the human development index (HDI). The HDI, the complementary composite indices, and the multidimensional poverty index for selected years are given in the tables.

Figure 5-1 **UNDP human development framework**

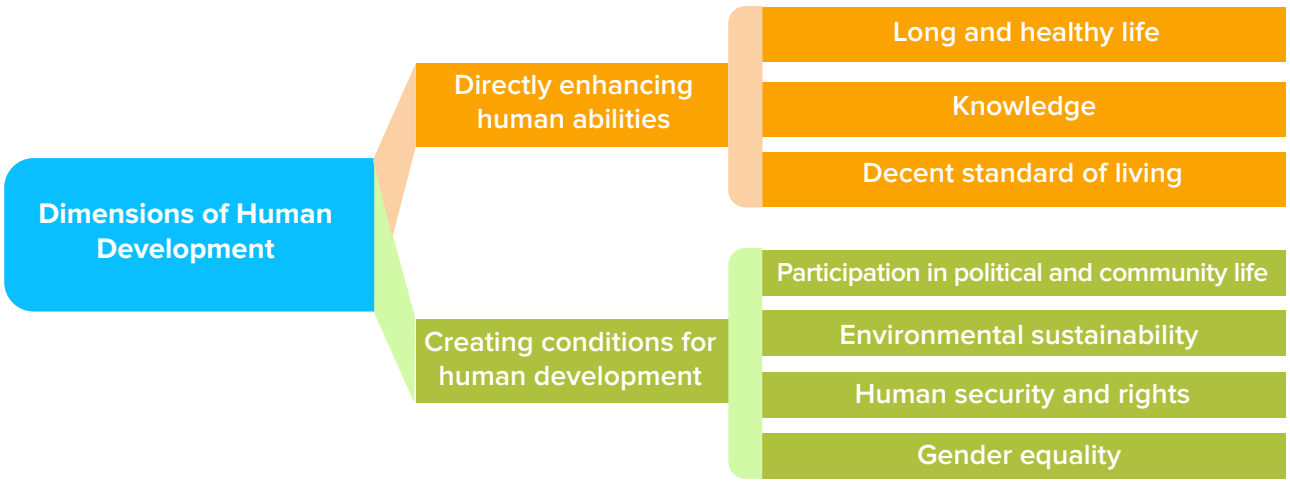


Figure 5-2 UNDP human development index: the measurement framework

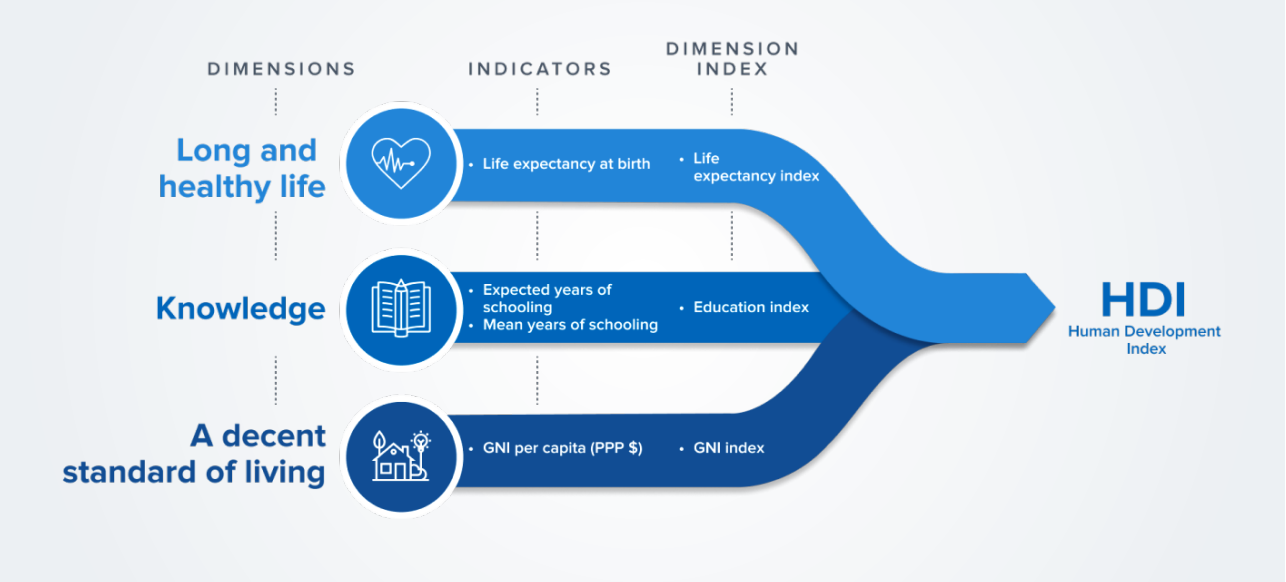


Table 5-1 HDI and composite indices for Mongolia

Year	HDI Value	Inequality-Adjusted HDI	Overall loss (%)	Gender Development Index	Gender Inequality Index	Planetary Pressures Adjusted HDI	Difference from HDI value (%)	CO_2 Emissions Per Capita (production) (tonnes)	Material footprint per capita (tonnes)
2010	0.700	0.592	18.2	1.035	0.415	0.629	10.14	5.09	19.09
2015	0.739	0.634	16.6	1.034	0.334	0.626	15.29	7.85	28.78
2016	0.741	0.637	16.3	1.034	0.329	0.628	15.25	8.46	27.46
2017	0.742	0.638	16.3	1.033	0.327	0.61	17.79	11.03	29.83
2018	0.754	0.645	16.2	1.035	0.32	0.601	20.29	14.32	30.90
2019	0.749	0.649	15.9	1.041	0.311	0.606	19.09	14.62	26.79
2020	0.740	0.648	16.0	1.045	0.304	0.618	16.49	11.25	25.74
2021	0.730	0.644	15.7	1.040	0.303	0.61	16.44	11.43	25.44
2022	0.741	0.645	14.9	1.032	0.297	0.619	16.46	11.43	25.31

Source: Human Development Index Report Data Centre

Annex – II

Human development indices for landlocked countries in Asia and the Pacific and Central Asia

Figure 5-2 The human development index and its components

		SDG3	SDG4.3	SDG4.4	SDG8.5		
Country	Human development index (HDI)	Life expectancy at birth	Expected years of schooling	Mean years of schooling	Gross national income (GNI) per capita	GNI per capita rank minus HDI rank	HDI rank
World	0.739	72.0	13.0	8.7	17,254	..	..
OECD	0.906	80.1	16.6	12.2	46,318	..	..
Europe and Central Asia	0.796	72.9	15.4	10.6	19,352	..	..
East Asia and Pacific	0.766	76.2	14.5	8.2	16,138	..	..
South Asia	0.641	68.4	11.9	6.6	6,972	..	..
Afghanistan	0.462	62.9	10.7	2.5	1,335	2	181
Bhutan	0.681	72.2	13.1	5.8	10,625	-15	125
Kazakhstan	0.802	69.5	14.8	12.4	22,587	5	65
China	0.788	78.6	15.2	8.1	18,025	0	75
Turkmenistan	0.744	69.4	13.2	11.1	12,860	1	93
Mongolia*	0.741	72.7	14.5	9.4	10,351	15	96
Uzbekistan*	0.727	71.7	12.0	11.9	8,056	16	105
Kyrgyzstan*	0.701	70.5	13.0	12.0	4,782	28	116
Tajikistan*	0.679	71.3	10.9	11.3	4,807	18	125
Nepal*	0.601	70.5	12.6	4.5	4,026	5	149

* Landlocked Countries in Asia and Central Asia

Source: Human Development Index Report Data Centre

Figure 5-3 Human development indices

Country	Human Development Index (HDI)	Inequality-adjusted Human Development Index (IHDI)	Gender Development Index	Gender Inequality Index	Multidimensional Poverty Index	Planetary Pressure-adjustment for HDI
World	0.739	0.576	0.951	0.958	..	0.685
OECD	0.906	0.803	0.984	0.985	..	0.787
Europe and Central Asia	0.802	0.708	0.963	0.961	0.004	0.743
East Asia and Pacific	0.766	0.640	0.962	0.978	0.022	0.683
South Asia	0.641	0.443	0.855	0.852	0.091	0.622
Afghanistan	0.462	0.300	0.622	0.665	0.272	0.459
Bhutan	0.681	0.465	0.970	0.334	..	0.615
Kazakhstan	0.802	0.734	0.998	0.177	0.002	0.688
China	0.788	0.662	0.962	0.186	0.016	0.679
Turkmenistan	0.744	..	0.951	0.462	0.001	0.662
Mongolia*	0.739	0.645	1.032	0.297	0.028	0.619
Uzbekistan*	0.727	...	0.924	0.242	0.006	0.696
Kyrgyzstan*	0.701	0.634	0.975	0.345	0.001	0.683
Tajikistan*	0.685	0.585	0.919	0.269	0.029	0.664
Nepal*	0.601	0.424	0.885	0.495	0.074	0.581

* Landlocked Countries in Asia and Central Asia

Source: Human Development Index Report Data Centre

Annex – III

Multidimensional poverty index (MPI) for Mongolia

Figure 5-4 The most recent MPI for Mongolia relative to selected countries and region

Countries/Region	Survey year	MPI value	Head count %	Intensity of Deprivation	Population Share			Contribution of deprivation in dimension to overall multidimensional poverty (%)		
					Vulnerable to MP	In severe MP	Below income poverty line	Health	Education	Standard of living
Mongolia	2018	0.028	7.3	38.8	15.5	0.8	0.7	21.1	26.8	52.1
Kyrgyzstan	2018	0.001	0.4	36.3	5.2	0	1.3	64.6	17.9	17.5
Turkmenistan	2019	0.001	0.2	34	0.3	0	0	82.4	15.5	2.1
East Asia and the Pacific	-	0.022	5.1	42.4	14.4	0.9	0.8	28.1	35.8	36.1

Source: Human Development Index Report Data Centre

BOX 5-1 Multidimensional poverty index

The multidimensional poverty index (MPI) from UNDP offers a comprehensive measure of acute multidimensional poverty across developing countries. It evaluates overlapping deprivations in three critical dimensions: health, education, and standard of living. Each dimension is equally weighted and comprises specific indicators. Health and education have two indicators each, while standard of living boasts six. The MPI is constructed from a single household survey, ensuring data consistency. The value of the MPI is the product of the incidence of multidimensional poverty and the intensity of the deprivations.

A household is deemed multidimensionally poor if its deprivation score exceeds 1/3. Those with scores between 1/5 and 1/3 are vulnerable to multidimensional poverty, and scores of 1/2 or more indicate severe multidimensional poverty.

For Mongolia, data from the 2018 Multiple Indicator Cluster Survey reveals that 7.3 percent of the population are multidimensionally poor. An additional 16 percent are vulnerable in this view of poverty. The intensity of these deprivations in Mongolia stands at 39 percent. The MPI value for Mongolia is 0.028, which is the share of the population that is multidimensionally poor, adjusted by the intensity of their deprivations. For context, comparable countries like Kyrgyzstan and Turkmenistan have MPI values of 0.001 each.

When comparing multidimensional poverty with monetary poverty (measured by the percentage of the population living below 2017 $PPP 2.15 per day), the incidence of multidimensional poverty in Mongolia is 6.6 percentage points higher than for monetary poverty. This indicates that even those living above the monetary poverty line might still face deprivations in health, education, or standard of living. The contributions of deprivations in each dimension to overall poverty provide a comprehensive view of multidimensional poverty in Mongolia. Specifically, health contributes 21 percent, education 27 percent, and standard of living 52 percent to Mongolia's overall multidimensional poverty.

Structure of the MPI

Dimensions of Poverty	Indicator	Weight
Health	Nutrition	1/6
	Child mortality	1/6
Education	Years of schooling	1/6
	School attendance	1/6
Standard of living	Cooking Fuel	1/18
	Sanitation	1/18
	Drinking Water	1/18
	Electricity	1/18
	Housing	1/18
	Assets	1/18

Source: UNDP HDRO

Annex – IV

Consulted Organizations

Public sector consultations		
1	Ministry of Labour and Social Protection	Mr. Altantulga, Employment Promotion department
2	Ministry of Environment and Climate Change	Ms. S. Erdenetsetseg, Senior expert in charge of environmental and tourism integrated policy and planning, Department of Climate Change and Policy Planning
3	New Recovery Policy Accelerator	Lkhagvasuren Enkhtur, Infrastructure Project Manager
4	Ministry of Finance	Batmunkh Enkhtur, Head of Budget Consolidation Department Delgerjargal, Head of Budget Investment Division
5	Ministry of Energy,	Baldorj, Officer
6	Ministry of Economy and Development	Mungunsukh, Heal of Social Development Policy Division Macro-Economic Policy Department
7	Ministry Education and Science	Mrs. Bumangerel Tsagaan-Uvgun, Education Quality Monitoring Department
8	National Center for Public Health	Dr. Oyun-Erdene, Environmental pollution experts Ch. Myagmardorj - National center for public health
Development Partner		
9	GGGI	Matthieu Le Blan, Country Representative Annaka Peterson former country representative Bayarkhuu Chinzorigt, Senior Energy and Climate Officer
10	Abt Associates,	JAMBAA Lkhagva Deputy Chief of Party, USAID funded, Mongolia Energy Governance Activity
11	ADB	Kate Hughes, Senior Climate Change Specialist, ADB Climate Change and Sustainable Development Department Jairus Carmela C. Josol
12	EBRD	Hannes Takacs, Director
13	UNDP NDC,	Saruul Dolgorsuren, National Project Coordinator, Climate Projects
14	People in Need NGO,	Bulgantamir – People in Need NGO, Programme Manager of Climate Change Resilience
Private Sector Consultations		
15	Mongolian Renewables Industries Association (MRIA)	Khulan Tumurbaatar, CEO Otgonbaatar Jambaljamts, President Khurelbat Banzragch, Advisor
16	NEWCOM	Gankhuyag, Chief Infrastructure Officer, Newcom Group Nomin, Analyst Nomin
CSOs and academia		
17	National University of Medical Science	Dr. Batzorig Bayartsogt – National University of Medical Science
18	Independent Consultant Passive Housing	Mr. Ganbaa Nyamaa, Energy Efficient Building expert

References

Access Solutions LLC. (2019). Mongolia in the Digital Age. Retrieved from https://artnet.unescap.org/sites/default/files/file-2019-11/Digital%20Readiness%20Assessment%20Final%20Draft%20%2009.09.pdf

ADB. (2018). Sector Assessment: Energy. Retrieved from https://www.adb.org/sites/default/files/linked-documents/51199-001-sd-01.pdf

ADB. (2020, March). First Utility-Scale Energy Storage Project: Report and Recommendation of the President. Retrieved from ADB Projects: https://www.adb.org/projects/documents/mon-53249-001-rrp

ADB. (2020a). Unlocking Mongolia's Rich Renewable Energy Potential. Retrieved from Asian Development Bank: https://www.adb.org/news/features/unlocking-mongolias-rich-renewable-energy-potential

ADB. (2020b). Mongolia: Strategy for Northeast Asia Power System Interconnection. Retrieved from https://www.adb.org/sites/default/files/project-documents/48030/48030-001-tacr-en_4.pdf

ADB. (2021c). Keeping the milk and cash flowing in Mongolia. Retrieved from https://www.adb.org/results/keeping-milk-and-cash-flowing-mongolia

ADB. (2022a). Assessment of Gender Situation in the Energy Sector. Ulaanbaatar: Asian Development Bank.

ADB. (2022b, December). Impact of Gender Inequality on Long-Term Economic Growth in Mongolia. Manila: Asian Development Bank. doi:http://dx.doi.org/10.22617/WPS220574-2

ADB. (2023b, September). Asian Development Outlook (ADO) September 2023: Key Messages. Retrieved from ADB: https://www.adb.org/outlook/editions/september-2023

Bayasgalankhuu, L., Ilahi, S., Wei, W., & Wu, Y. (2022). Energy Analysis on Wheat Yield of Mongolian Agriculture. Retrieved from https://www.mdpi.com/2227-9717/10/2/190

Bignall, G. D. (2005). Geothermal Resources and Development in Mongolia: Country Update. (p. 5). Antalya, Turkey: Proceedings World Geothermal Congress 2005. Retrieved from https://www.geothermal-energy.org/pdf/IGAstandard/WGC/2005/0132.pdf

BOM. (2024, May 15). Bank of Mongolia Statistics. Retrieved from Bank of Mongolia: https://stat.mongolbank.mn/

Brown, K., & Fox, E. (2022). Mongolia – Challenges and Prospects in 2023. Retrieved from https://www.kcl.ac.uk/lci/assets/2023/mongolia-challenges-and-prospects-in-2023-report.pdf

Carlisle, S., & Pevzner, N. (2019). MONGOLIAN ENERGY FUTURES: REPOWERING ULAANBAATAR. Retrieved from https://kleinmanenergy.upenn.edu/wp-content/uploads/2020/08/KCEP-Mongolian-Energy-Futures-Singles-1.pdf

Crisis24. (2023, December 13). Mongolia: Power supply disruptions likely to continue nationwide through at least late December. Crisis24 Alerts, p. 1. Retrieved from https://crisis24.garda.com/alerts/2023/12/mongolia-power-supply-disruptions-likely-to-continue-nationwide-through-at-least-late-december

Deloitte. (2016). The bottom line: Driving value through energy management in mining. Retrieved from https://www2.deloitte.com/content/dam/Deloitte/jp/Documents/global/gx-er-the-bottom-line.pdf

Deloitte. (2016b). Using Renewable Energy to Drive Supply Chain Innovation. 6 Deloitte Development LLC. Retrieved from https://www2.deloitte.com/content/dam/Deloitte/nl/Documents/energy-resources/deloitte-nl-er-renewable-energy-sources.pdf

Deloitte. (2017). Renewables in Mining: Rethink, Reconsider, Replay. Retrieved from https://www2.deloitte.com/content/dam/Deloitte/jp/Documents/global/gx-renewables-in-mining-final-report-for-web.pdf

Department of Commerce USA. (2016). Mongolia - Agricultural Sector. Retrieved from https://www.privacyshield.gov/ps/article?id=Mongolia-Agricultural-Sector

ERC. (2023b). Statistics on Energy Performance 2022. Ulaanbaatar, Mongolia.

ERC. (2023c). Objectives for 2023. Retrieved February 2024, from https://erc.gov.mn/web/en/goal23

ERC. (2024). System Load Reached 1465 MW. Ulaanbaatar: Energy Regulator. Retrieved from https://erc.gov.mn/web/en/news/837

ESCAP. (2024). SDG 7 Road Map for Mongolia . UNESCAP. Retrieved from https://nexstepenergy.org/roadmap/Mongolia

Ganbat, E. a. (2010). Geologic Background of the Hangay Geothermal System, West-Central Mongolia. Proceedings World Geothermal Congress 2010 (p. 4). Bali, Indonesia: www.geothermal-energy.org. Retrieved from https://www.geothermal-energy.org/pdf/IGAstandard/WGC/2010/1260.pdf

GGGI. (2020). Development of Green Energy Systems and Energy Effiency in Mongolia.

GIZ. (2020). The Mongolian electricity sector in the w context of international climate mitigation efforts. GIZ Mongolia.

GIZ. (2020a). Ulaanbaatar: Local Energy Efficiency Action Plan. Retrieved from https://ecc.erc.gov.mn/uploads/LEEAP/LEEAP_eng.pdf

GIZ. (2023). Economy-wide Impacts of Climate Change and Adaptation in Mongolia. Ulaanbaatar: Global Programme on Climate Resilient Economic Development (CRED). Retrieved from https://www.giz.de/en/downloads/giz2023-en-macro-impacts-e3-mongolia.pdf

GIZ. (2024). Assessment and Status Report on Just Energy Transition in Mongolia. Retrieved from https://www.jetknowledge.org/knowledge/giz-assessment-status-report-just-energy-transition-mongolia/

Global Forest Watch. (2024). Mongolia. Retrieved from Global Forest Watch: https://www.globalforestwatch.org/dashboards/country/MNG

GoM. (2020). EDUCATION SECTOR MID-TERM DEVELOPMENT PLAN. Ulaanbaatar: Government of Mongolia Ministry of Education and Science.

GOM. (2023). Mongolia Voluntary National Review 2023: Implementation of the Sustainable Development Goals. Government of Mongolia. Retrieved from https://hlpf.un.org/sites/default/files/vnrs/2023/VNR%202023%20Mongolia%20Report.pdf

GOM. (2023a). Mongolia's National Inventory Report 2023: Annex to Second Biennial Update Report to UNFCCC. Government of Mongoloia. Retrieved from https://unfccc.int/sites/default/files/resource/20231112_NIR_MGL.pdf

Government of Canada. (2024). Eligible retrofits and grant amounts. Retrieved from Government of Canada: https://natural-resources.canada.ca/energy-efficiency/homes/canada-greener-homes-grant/start-your-energy-efficient-retrofits/plan-document-and-complete-your-home-retrofits/eligible-grants-for-my-home-retrofit/23504

Government of Uzbekistan. (2023). Uzbekistan announces winners of tenders for Solar Power Plants in Jizzakh and Samarkand. Minsitry of Energy of the Republic of Uzbekistan. Retrieved from https://minenergy.uz/en/news/view/1263

Graceffo, A. (2022b, June 29). The Economics of Herding in Mongolia. Retrieved from IntelliNews: https://www.intellinews.com/the-economics-of-herding-in-mongolia-248998/

Herberg, J., Drewing, E., Reinermann, J.-L., Radtke, J., LaBelle, M., Stojilovska, A., & Gürtler, K. (2023). Energy spaces: bridging scales and standpoints of just energy transitions, Journal of Environmental Policy & Planning. Journal of Environmental Policy & Planning, 25(2), 135-141.

Hincks, J. (2018). Life in the Most Polluted Capital in the World. Retrieved from https://time.com/longform/ulan-bator-mongolia-most-polluted-capital/

ICEF. (2019, September). Mongolian outbound higher than estimated, most of it going to Asian powerhouses. Retrieved from ICEF Monitor: https://monitor.icef.com/2019/09/mongolian-outbound-higher-than-estimated-most-of-it-going-to-asian-powerhouses/

IEA. (2023a). Renewables: Analysis and Forecast of 2028. Retrieved from https://iea.blob.core.windows.net/assets/96d66a8b-d502-476b-ba94-54ffda84cf72/Renewables_2023.pdf

IEA. (2024). Equality in Energy Transitions. Retrieved from Technology collaboration Program by IEA: https://www.equality-energytransitions.org/about/

IEA. (2024). Where does Mongolia get its electricity? Retrieved from Mongolia: https://www.iea.org/countries/mongolia/electricity

IFC. (2023). In Uzbekistan, Solar Power Fires Up Reforms and Investment in Energy Sector. Retrieved from International Finance Corporation: https://www.ifc.org/en/stories/2022/uzbekistan-solar-power

Igogo, T. e. (2020). Integrating Clean Energy in Mining Operations: Opportunities, Challenges, and Enabling Approaches. Retrieved from https://www.nrel.gov/docs/fy20osti/76156.pdf

IHME. (2024, May 15). Health Data. Retrieved from Institute of Health and Metrics and Evaluation: Accessed on : https://vizhub.healthdata.org/gbd-compare/#

IKI JET. (2023). Innovation Regions for a Just Energy Transition - IKI JET. Retrieved October 4, 2024, from IKI NEWS: https://ikinews.climatechange.vn/wp-content/uploads/2023/10/4.2_EN_IKI-JET-VNM-Introduction_Final-3.pdf

IKON. (2023, September). B. Choijilsuren: It is necessary to limit electricity from tomorrow or even today. Retrieved from IKON: https://ikon.mn/n/311o

IOM. (2022). Ulaanbaatar: Rapid Assessment on Population, Migration and Needs. Retrieved from https://dtm.iom.int/sites/g/files/tmzbdl1461/files/reports/Ulaanbaatar_Phase2_ENG.pdf

IOM. (2023). Internal Migration Situation in Mongolia: Situation Analysis Report. Retrieved from https://publications.iom.int/system/files/pdf/Internal-Migration-Situation-in-Mongolia.pdf

IRENA. (2016). Mongolia Renewable Energy Readiness Assessment. Retrieved from https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2016/IRENA_RRA_Mongolia_2016.pdf

IRENA. (2019). Renewable Energy: A Gender Perspective. Retrieved from https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Jan/IRENA_Gender_perspective_2019.pdf

IRENA. (2023a). Renewable energy solutions for heating systems in Mongolia: Developing a Strategic heating plan. Abu Dhabi: International Renewable Energy Agency.

IRENA. (2023b). Renewable Power Generation Costs in 2022. Retrieved from https://www.irena.org/Publications/2023/Aug/Renewable-Power-Generation-Costs-in-2022

JICA. (2013). Master Plan Study for Coal Development and Utilization. JICA. Retrieved from https://openjicareport.jica.go.jp/pdf/12145934.pdf

Jun, S. (2021). Is the Raw Coal Ban a Silver Bullet to Solving Air Pollution in Mongolia?: A Study of the Mongolian Government's Air Pollution Reduction Policies and Recommendations in the Context of COVID-19. Retrieved from https://jpia.princeton.edu/news/raw-coal-ban-silver-bullet-solving-air-pollution-mongolia-study-mongolian-governments-air

K.Amina. (2017). First combined solar power and agriculture project commences. Retrieved from https://montsame.mn/en/read/132645#:~:text=Solar%20panels%20were%20installed%20on,and%20energy%2C%20underlined%20the%20contractors.

Khankhuu, J. (2024, 05 08). Agreement Signed to Implement Soft Loan Program for Herders. Retrieved from https://montsame.mn/en/read/343415

Kingsley, P. (2017). Nomads no more: why Mongolian herders are moving to the city. Retrieved from https://www.theguardian.com/world/2017/jan/05/mongolian-herders-moving-to-city-climate-change

MEEI. (2024). Technical Study on Reforming Energy Subsidies to Support Renewable Energy Development in Mongolia. United Nations (Unpublished).

Mendee, J., Altanzaya, L., & Undrakh, B. (2022). Mongolian Kazakhs: from Bayan-Ulgii to the World. Retrieved from https://library.fes.de/pdf-files/bueros/mongolei/19174.pdf

Mongolian Economy. (2020). Does Mongolia Need Rare Earth Elements. Retrieved from Mongolian Economy: https://mongolianeconomy.mn/en/does-mongolia-need-rare-earth-elements/

Munkhbaatar, Battulga et. al. (2022). Load Flow, Load Loss and Short Circuit Analysis of The Third Thermal Power Plant's Electrical Supply System. Embedded Selforganising Systems. 9. 9-14. http://dx.doi.org/10.14464/ess.v9i1.508 .

Munkhzul, A. (2022, 01 26). Oyu Tolgoi project to be supplied power from power grid of Mongolia. Retrieved from Montsame: https://montsame.mn/en/read/288135

Nedopil, C. A. (2024). China coal exit: Opportunities for China-led financing of early phase down of coal-fired power plants in Pakistan and Vietnam . Fudan University, Shanghai: Green Finance & Development Center (GFDC). Retrieved from https://greenfdc.org/china-coal-exit-opportunities-for-china-led-financing-of-early-phase-down-of-coal-fired-power-plants-in-pakistan-and-vietnam/

NEMA. (2024). Data and Statistics. Retrieved from National Emergency Management Agency: http://en.nema.gov.mn/

Ngum, S., & Kim, L. (2023). Powering a Gender-just Energy Transition. Green Growth Knowledge Platform. Retrieved from https://www.greenpolicyplatform.org/sites/default/files/downloads/resource/FINAL_230315_GGKP_Gender_Report%5B13%5D_0.pdf

Nilsson, A., Vivero, G. d., Legarreta, P. L., Day, T., Pudlik, M., Seyfang, B., & Dugarjav, B. (2021). Green Hydrogen Applications in Mongolia. Retrieved from https://newclimate.org/sites/default/files/2021/10/NewClimate_Green_Hydrogen_Applications_in_Mongolia.pdf

NSO. (2020). Labour Force Survey. Ulaanbaatar: National Statistical Office. Retrieved from https://downloads.1212.mn/1._report_LFS_eng.pdf

NSO. (2023). Mongolian Statistical Yearbook 2022. Ulaanbaatar, Mongolia: NationalStatistics office of Mongolia.

NSO. (2024a). Statistical Data. Retrieved February 2024, from National Staistics Office of Mongolia: https://1212.mn/en/statistic/

Qiang, E. (2021). Life with Pollution vs. Life in Poverty: A No-Win Dilemma. Retrieved from https://kleinmanenergy.upenn.edu/news-insights/life-with-pollution-vs-life-in-poverty-a-no-win-dilemma/

Reach Project. (2020). Mongolia's Renewable Energy for Rural Access Project: Providing Electricity to Nomadic Herders. Toronto, Canada: Munk School of Global Affairs & Public Policy, University of Toronto. Retrieved from https://reachalliance.org/wp-content/uploads/2020/03/REACH2020-Mongolia.pdf

Ren Yaun, e. a. (2023). The Short- and Long-Run Impacts of Air Pollution on Human Health: New Evidence from China. International Journal of Environmental Research and Public Health, 20(3). Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9916337/

Roberts, D. (2020). 4 astonishing signs of coal's declining economic viability. Retrieved from https://www.vox.com/energy-and-environment/2020/3/14/21177941/climate-change-coal-renewable-energy

Rosario, J. D. (2024). Mongolia needs mining investments ramp up to meet GDP target -finance minister. Reuters. Retrieved from https://www.reuters.com/markets/asia/mongolia-needs-mining-investments-ramp-up-meet-gdp-target-finance-minister-2024-01-09/

Sambuu, T., Gunsmaa, G., Badarch, T. U., Mukhtar, Y., & Ichikawa, M. (2023, May 18). Carbon Monoxide Poisoning Following a Ban on Household Use of Raw Coal, Mongolia. 171(7), 470-477. doi:10.2471/BLT.22.289232

Sun, Z., Zhang, F., Wang, Y., & Shao, Z. (2023, June 29). Literature Review and Analysis of the Social Impact of a Just Energy Transition. Frontiers in Sustainable Food Systems, 7. doi:https://doi.org/10.3389/fsufs.2023.1119877

Tamir, K. U. (2015, August). Issues of small scale renewable energy systems installed in rural Soum centres in Mongolia. Energy for Sustainable Development, 27, 1-9. doi:https://doi.org/10.1016/j.esd.2015.04.002

TheCoalTrader. (2023). Mongolia's Coal Exports Surge in 2023. Retrieved from thecoaltrader.com: https://thecoaltrader.com/mongolias-coal-exports-surge-in-2023/

UN. (2023, April). Policy Paper: The Socioeconomic Impact of the War in Ukraine on Mongolia.

UN Mongolia. (2023). Common Country Analysis (CCA) Mongolia 2022 Update. Retrieved from https://mongolia.un.org/en/231161-common-country-analysis-cca-mongolia-2022-update

UN News. (2023, December 14). COP28 ends with call to 'transition away' from fossil fuels; UN's Guterres says phaseout is inevitable. (https://news.un.org/en/story/2023/12/1144742, Producer) Retrieved February 2024

UN News. (2024, February 9). Mongolian dzud: Extreme weather puts 90% of country at 'high risk' . Retrieved from https://news.un.org/en/story/2024/02/1146422

UN Women & UNIDO. (2023). Gender Equality and the Sustainable Energy Transition. Retrieved from https://www.unwomen.org/sites/default/files/2023-05/Gender-equality-in-the-sustainable-energy-transition-en.pdf

UNDP. (2013). Derisking Renewable Energy Investment Framework. United Nations Development Program. Retrieved from https://www.undp.org/energy/our-flagship-initiatives/derisking-renewable-energy-investment-framework

UNDP. (2018a). Derisking Renewable Energy Invesmtent: Off-Grid Electrification. United Nations Development Program. Retrieved from https://www.undp.org/publications/drei-grid-electrification-2018

UNDP. (2021). Bridging the Digital Divide in Mongolia. Retrieved from https://www.undp.org/mongolia/blog/bridging-digital-divide-mongolia

UNDP. (2022). Uncertain Times, Unsettled Lives: Shaping our Future in a Transforming World. United Nations Development Program. Retrieved from https://hdr.undp.org/content/human-development-report-2021-22

UNDP. (2023, January 17). Sustainable Energy Hub. Retrieved from The 8 core principles of a Just Energy Transformation: https://www.undp.org/energy/publications/8-core-principles-just-energy-transformation

UNDP. (2023a). Global Multidimensional Poverty Index (MPI). New York: United Nations Development Programme. Retrieved from https://hdr.undp.org/system/files/documents/hdp-document/2023mpireporten.pdf

UNDP. (2023b). Human Development Index (HDI). Retrieved from https://hdr.undp.org/data-center/human-development-index#/indicies/HDI

UNDP. (2023c). Mongolia: Country Specific Data. Retrieved from https://hdr.undp.org/data-center/specific-country-data#/countries/MNG

UNDP. (2023d). Briefing note for countries on the 2023 Multidimensional Poverty Index: Mongolia. Retrieved from https://hdr.undp.org/sites/default/files/Country-Profiles/MPI/MNG.pdf

UNDP. (2023e). SDG Interlinkages for Mongolia. Retrieved March 2024, from SDG Push Diagnostics: https://sdgdiagnostics.data.undp.org/MNG/synergies-and-tradeoffs

UNDP. (2024). Making our Future: New Directions for Human Development in Asia and the Pacific. Retrieved February 2024, from Asia-Pacific Human Development Report: https://www.undp.org/asia-pacific/rhdr2024

UNDP. (2024a). Breaking the Gridlock: Reimagining Cooperation in a Polarized World - HDR 2023-24. Retrieved February 2024, from UNDP Asia and the Pacific: https://hdr.undp.org/content/human-development-report-2023-24

UNDP. (2024e). Human Development Data. Retrieved from Human Development Reports: https://hdr.undp.org/data-center

UNDP. (2024f (forthcoming)). Air pollution investment case for Ulaanbaatar, Mongolia.

UNDP. (n.d.). Human Development Report 2023/2024 technical notes. Retrieved from https://hdr.undp.org/sites/default/files/2023-24_HDR/hdr2023-24_technical_notes.pdf

UNEP. (2018, Nov 26). The importance of Mongolia's boreal forests. Retrieved from UNEP News: https://www.unep.org/news-and-stories/story/importance-mongolias-boreal-forests

UNICEF. (2018). Mongolia's Air Pollution Crisis: A Call to Action to Protect Children's Health. Retrieved from https://www.unicef.org/eap/sites/unicef.org.eap/files/press-releases/eap-media-Mongolia_air_pollution_crisis_ENG.pdf

UNICEF. (2020). Cost of absenteeism due to air pollution among private sector companies in Ulaanbaatar, Mongolia. UNICEF. Retrieved from https://www.unicef.org/mongolia/reports/cost-absenteeism-due-air-pollution-among-private-sector-companies-ulaanbaatar-mongolia

UNICEF. (2021). 2021 MICS EAGLE Mongolia Education Fact Sheet. Retrieved from https://www.bing.com/ck/a?!&&p=19b5f6270b3d9346JmltdHM9MTcxNzU0NTYwMCZpZ3VpZD0xNDJiZjcxMy00MTE5LTYzNDYtMWJmYi1lMzk1NDBkOTYyYzEmaW5zaWQ9NTE5OA&ptn=3&ver=2&hsh=3&fclid=142bf713-4119-6346-1bfb-e39540d962c1&psq=2021+mics+eagle+mongolia+education+fact+sheet&u=

UNICEF. (2022). MICS PLUS. Retrieved from UNICEF MICS: https://mics.unicef.org/mics-plus/mics-plus-results#mongolia%202022-23

UNICEF. (2022). Mongolia MICS PLUS 2022-2023. UNICEF MICS Plus Global. Retrieved from https://mics.unicef.org/mics-plus/mics-plus-results#mongolia

UNICEF. (2023). Impact of Air Pollution on Maternal and Child Health: Milestones and Innovation. Retrieved from https://www.unicef.org/mongolia/media/5071/file/Impact%20of%20Air%20Pollution%20on%20Maternal%20and%20Child%20Health%20Project%20(2018-2023).pdf

UNICEF. (2024). Mongolia Country Profile. Retrieved from UNICEF Data: https://data.unicef.org/country/mng/

United Nations. (2024). 2024 Dzud Early Action & Response Plan mongolia. UNOCHA. Retrieved from https://www.unocha.org/publications/report/mongolia/mongolia-2024-dzud-early-action-response-plan-dec-2023-may-2024

United Nations. (2024). 2024 Dzud Response Plan. Ulaanbaatar: United Nations. Retrieved from https://reliefweb.int/report/mongolia/mongolia-dzud-response-plan-dec-2023-june-2024-issued-25-march-2024

Van Der Kooij, S., Zwarteveen, M., Boesveld, H., & Kuper, M. (2013, May 31). The Efficiency of Drip Irrigation Unpacked. Agricultural Water Management, 123. doi:https://doi.org/10.1016/j.agwat.2013.03.014

Walmsley, M. R., Walmsley, T. G., Atkins, M. J., & Neale, J. R. (2016). Sustainable Milk Powder Production using Enhanced Process Integration and 100 % Renewable Energy. Retrieved from https://core.ac.uk/download/pdf/79181342.pdf

Weinreb, E. (2013, Feb 20). Talent Show: At work, do women care more than men about sustainability? Retrieved from GreenBiz: https://www.greenbiz.com/article/work-do-women-care-more-men-about-sustainability

World Bank & ADB. (2021d). Climate Risk Country Profile: Mongolia. Retrieved from https://www.adb.org/sites/default/files/publication/709901/climate-risk-country-profile-mongolia.pdf

World Bank. (2015). Providing Mongolia's Rural Communities with Sustainable Livelihoods. Ulaanbaatar, Mongolia. Retrieved from https://www.worldbank.org/en/news/feature/2015/05/07/providing-mongolias-rural-communities-with-sustainable-livelihoods

World Bank. (2020a). Mongolia Poverty Update 2018. Retrieved from https://documents.worldbank.org/en/publication/documents-reports/documentdetail/532121589213323583/mongolia-poverty-update-2018

World Bank. (2020b). Mongolia InfraSAP: Infrastructure for Connectivity and Economic Diversification.

World Bank. (2022d). Mongolia Jobs Diagnostic: More Vibrant and Inclusive Labor Markets for Economic Recovery and Diversification. Ulaanbaatar: The World Bank. doi:http://documents.worldbank.org/curated/en/099030001132333606/P17445302d04700790adb8066bc652052a1

World Bank. (2023a). Mongolia Economic Update: Robust but Unbalanced Growth. Retrieved from https://thedocs.worldbank.org/en/doc/aebdd3a2c3fb72b341d2d65d2e8c1845-0070012023/original/Mongolia-Economic-Update-Nov-2023.pdf

Wu, Y., & Cui, C. R. (2019). Paving the way to sustainable heating in Mongolia. Retrieved from https://blogs.worldbank.org/eastasiapacific/paving-way-sustainable-heating-mongolia

United Nations Development Programme

www.undp.org/mongolia