

Mongolia InfraSAP

Infrastructure for Connectivity
and Economic Diversification

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MONGOLIA - GOVERNMENT FISCAL YEAR

January 1 - December 31

CURRENCY EQUIVALENTS

(Exchange Rate Effective as of September 29, 2020)

Currency Unit = Tugrug (MNT)

US\$1.00 = MNT 2,854.40

Abbreviations

ATP	Automatic Train Protection
AUES	Altai-Uliastai Energy System
BESS	Battery Energy Storage System
BOT	Build-Operate-Transfer
BT	Build-Transfer
BOOT	Build-Own-Operate-Transfer
BRI	Belt and Road Initiative
CBM	Coal Bed Methane
CBTC	Communication Based Train Control
CES	Central Energy System
CHP	Combined Heat and Power
CMREC	China-Mongolia-Russia Economic Corridor
COVID-19	Coronavirus Disease 2019
CTC	Centralized Traffic Control
DBM	Development Bank of Mongolia
DFI	Development Finance Institution
DFS	Digital Financial Services
DH	District Heating
DRI	Direct Reduction Iron
DSO	Direct Shipping Ore
EAP	East Asia Pacific
EBRD	European Bank for Reconstruction and Development
EES	Eastern Energy System
EFF	Extended Fund Facility
ERP	Economic Recovery Program
ESMAP	Energy Sector Management Assistance Program
ESMP	Energy Sector Master Plan
ETT	Erdenes Tavan Tolgoi
FDI	Foreign Direct Investment
FSF	Fiscal Stabilization Fund

GDP	Gross Domestic Product
GGGI	Global Green Growth Institute
GHG	Greenhouse Gas
GoM	Government of Mongolia
GW	Gigawatt
HF	Heritage Fund
HDF	Human Development Fund
ICNC	Information Communication Network Company
ICT	Information Communication Technology
IFC	International Finance Corporation
IFI	International Finance Institutions
IMF	International Monetary Fund
InfraSAP	Infrastructure Sector Assessment Program
IPO	Initial Public Offering
IPP	Independent Power Producer
ITS	Intelligent Transport System
JICA	Japan International Cooperation Agency
JSC	Joint Stock Company
KP	Kimberley Process
KPCS	Kimberley Process Certification System
LLC	Limited Liability Company
LTE	Long-term Evolution
MFA	Ministry of Foreign Affairs
MFD	Mobilizing Finance for Development
MIGA	Multilateral Investment Guarantee Agency
MoF	Ministry of Finance
MOU	Memorandum of Understanding
MUB	Municipality of Ulaanbaatar
MW	Megawatt
NAO	National Audit Office
NAPSI	North Asia Power Sector Interconnection
NDA	National Development Agency
NDC	Nationally Determined Contributions
NDC	National Dispatch Center
NGO	Non-Government Organization
NSO	National Statistics Office
ODA	Official Development Assistance

OECD	Organization for Economic Cooperation and Development
OT	Oyu Tolgoi
PBR	Performance-based Regulation
PCSP	Policy Coordination on State Property
PIM	Public Investment Management
PIP	Public Investment Model
PPP	Public-Private Partnership
PRC	People's Republic of China
PV	Photovoltaic
RBTC	Radio-based Train Control
RDD	Road Development Department
ROT	Rehabilitate-Operate-Transfer
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
SALB	Second Administrative Level Boundaries
SES	Southern Energy System
SHS	Solar Home Systems
SME	Small to Medium Enterprise
SOE	State-owned Enterprise
SX-EW	Solvent Extraction Electro Winning
TDBM	Trade and Development Bank of Mongolia
TT	Tavan Tolgoi
TTPP	Tavan Tolgoi Power Plant
TWh	Terawhatt-hour
UB	Ulaanbaatar
vRE	Variable Renewable Energy
VSAT	Very Small Aperture Terminal
WB	World Bank
WDC	World Diamond Council
WES	Western Energy System
WTO	World Trade Organization

EXECUTIVE SUMMARY

Mongolia's vast territorial expanse and low population density create unique challenges for economic development in general and infrastructure investments in particular. The challenge for economic development is that many economic activities thrive on agglomeration. In other words, economic activities tend to be more profitable if the economic distance to suppliers, customers, and peers is short. Large countries with low population densities face sharp trade-offs between the drive toward greater concentration for economic reasons and the desire to prevent the complete depopulation of their territory for strategic, historic, and cultural reasons. Mongolia's population is concentrated in the capital, Ulaanbaatar, and a couple of other cities, but some of its economic activity, such as livestock herding, mining, and renewable energy generation is in places far away from cities. Although infrastructure development can help reduce economic distance and thus make economic activities in remote locations viable, a country like Mongolia cannot afford to connect the whole country with infrastructure, because the economic return is too low.

These unique challenges are compounded by huge mineral resources, which have driven economic growth over the past 15 years but left the economy highly dependent on the mining sector. Investments in commercially developing only a small part of Mongolia's abundant mineral resources resulted in a doubling of the country's GDP in 10 years, shifting the country's traditional agricultural economy to one dominated by mining. The country's largest project - the Oyu Tolgoi copper and gold mine - is expected to account for up to 30 percent of GDP once operating at full scale. The mining industry already contributes 20 percent to Mongolia's GDP and 90 percent to its exports, and it accounts for most of the country's foreign direct investment. Some of Mongolia's richest mining deposits are in areas without any prior infrastructure connection. Exploiting Mongolia's mining wealth thus requires investments in transport and energy connections, which account for a considerable share of the costs of developing mineral resources. The question is whether these investments can be leveraged to develop other economic activities and to help Mongolia gradually diversify its highly mining-dependent economy.

A third unique feature is Mongolia's geographic location, sandwiched between China and the Russia, two of the largest countries and economies in the world. The proximity to China has given Mongolia a ready outlet for its mineral wealth, with exports to China accounting for over 90 percent of total mineral exports. Russia has strong historical links with Mongolia's economy, reflected in significant investment holdings in various sectors. The route through Mongolia is a potentially attractive transit corridor between the Beijing-Tianjin-Hebei economic cluster and Siberia, connecting with the Trans-Siberian railway link and on toward Europe, as it is significantly shorter than the northern route to the port of Vladivostok. Transit traffic along this route is limited, however, and Mongolia has not benefited from the lower transport costs of its exports to the Chinese and Russian markets or from transit revenues from use of this route. Whether the China-Mongolia-Russia Economic Corridor (CMREC), formalized in a 2014 agreement to forge closer economic ties among the three countries, can be leveraged to reduce the costs of economic distance for Mongolia remains an open question.

This InfraSAP analyzes Mongolia's infrastructure needs and investment priorities against the background of the country's low population density, high mining dependence, and landlocked location between China and Russia. It argues that these features impose the necessity to be selective in making investments in infrastructure. A "build and they will come" approach will not work. Instead, to materially reduce logistics costs, currently estimated at about 30 percent of GDP, Mongolia needs to select infrastructure investments based on a careful assessment of the economic opportunities such investments would leverage.

The InfraSAP suggests an approach to selecting priority infrastructure investments based on an analysis of key value chains in the economy. Mongolia's population is small relative to both

the country's size and its mineral wealth, limiting the range of economic activities in which it has a comparative advantage. In addition to the mining sector, key sectors of the economy that could be further developed are the livestock industry, including cashmere, meat, and dairy production; the tourism sector; digital services, based on Mongolia's high Internet penetration rate and high level of human capital; and the renewable energy sector, including wind and solar power. The focus on these sectors does not imply that other sectors should be neglected; it means that these five areas are likely to generate the scale of demand for infrastructure services to shape investment decisions. The InfraSAP therefore looks at key infrastructure gaps from the perspective of developing each of these value chains. The recommendations of this report contribute to Mongolia's stated objective of economic diversification.

Investments in infrastructure are more likely to lower costs and enhance competitiveness if they are targeted spatially to leverage synergies across activities along a corridor. This argument follows from Mongolia's particularly low density, which means that without the concentration of economic activities in particular locations along a corridor, demand for infrastructure services is unlikely to be enough to justify the investment. The specific investment opportunities looked into include (a) the China-Mongolia-Russia railway corridor and possible rail links to key mining deposits and processing facilities, (b) roads connecting the main urban centers in Mongolia, (c) the network of national and *Aimag* level roads used to evacuate livestock production from Mongolia's steppes to the markets of Ulaanbaatar and for export, and (d) the power grid, to link new sources of clean energy and significant underserved loads. A fragmented approach to developing infrastructure will not contribute to an accelerated achievement of economic diversification and connectivity.

The basic investment program outlined above faces several cross-cutting obstacles that will need to be overcome to help bridge the identified investment gaps. The report identifies and discusses three major obstacles:

- Mongolia's institutional infrastructure for the selection, planning, and implementation of infrastructure projects is fragmented and beset with governance problems. Several government institutions and public sector agencies are actors in selecting, planning, and implementing infrastructure investments. They include Parliament; the Ministry of Finance; the National Development Agency; the Government Agency for Policy Coordination on State Property; the Industrial Development and Innovation Agency of the Municipality of Ulaanbaatar; several infrastructure sector ministries, including roads and transport development, energy, and mining); the Ministry of Foreign Affairs; the state-owned enterprise Erdenes Mongol; and municipal and provincial governments. This large a group of institutions involved in infrastructure is not uncommon in middle- and high-income countries. However, in Mongolia the capacity of most of these agencies is low and their activities poorly coordinated, generating a public investment program that offers a little bit to everyone but fails to realize the potential synergies of a coordinated approach along specific value chains and corridors. The expected creation of a new Ministry for Economic Development, headed by a deputy prime minister, presents an opportunity to reduce fragmentation and improve the selection of investment projects.
- Mongolia's public envelope for financing infrastructure is very small. Mongolia already spends about 10 percent of GDP on infrastructure, but the dollar value of the spending is low, given the size of GDP. Mongolia's public debt to GDP ratio is relatively high, leaving limited space to complement budget resources with additional public borrowing. Realization of Mongolia's infrastructure investment opportunities will thus need to rely to a significant extent on the mobilization of private investment. In this regard, the role of Erdenes Mongol as a shareholder in many critical investment ventures may need to be reconsidered. The required equity contributions from public participation accounts for a substantial share of public investment, but it is not clear that the state's participation is needed to leverage commercial funding. The result is that the limited public investment spending is poorly prioritized. A substantial amount of investment flows into mining and other ventures that are likely to generate returns only in the very long run, with the remainder spread over a long list of projects, many of which remain unfinished for years.
- Mongolia's investment climate in general and its regulatory framework for infrastructure impose significant costs and risks on potential investors, limiting interest in and possibilities for leveraging private sector involvement more effectively. Four aspects are particularly important. First, Mongolia's mining-dependent economy has exhibited an unusually high degree of macroeconomic volatility. This volatility deters private investors, including in long-term infrastructure assets, the profitability of which may be highly affected by changes in exchange rates, inflation, and other macroeconomic variables. Better management of Mongolia's mining-induced macroeconomic cycles would contribute to encouraging greater investment in both infrastructure and other economic activities, contributing directly to the goal of economic diversification. Second, Mongolia's regulatory environment is a source of additional risks for investors. Unstable and onerous government rules and requirements, sometimes coupled with corruption and rent extraction, add to the cost of doing business. Third, Mongolia's regulatory environment in specific infrastructure sectors is uncertain. Tariffs are set in a discretionary manner, for example, and contracts questioned and

renegotiated, limiting the scope for private investors to come in and assume commercial risks. Fourth, Mongolia needs to reconsider how to attract investments in public-private partnerships (PPPs), through improved project preparation, competitive and transparent procurement, and the creative use of risk-sharing instruments, such as blended financing schemes with public or donor funds.

To address the challenges outlined above, this report develops three main recommendations. First, in selecting infrastructure priorities, Mongolia should look at key economic value chains and target infrastructure constraints specific to these value chains and associated corridors. Investment should be made where they will lower costs and enhance competitiveness the most. Rather than plan hundreds of projects, the government should focus on developing a medium-term strategic plan with a realistic priority list of projects, based on a rigorous economic and financial assessment of investment needs. Instead of projects being proposed by line ministries on an ad hoc basis, the medium-term and subsequent annual plans should be informed by the national master plan and linked to the Public Investment Plan process.

Government of Mongolia should target five strategic infrastructure interventions:

1. Infrastructure for the livestock value chain.

Development of the livestock sector should be supported by upgrading key parts and missing links of the 4,300 kilometers of roads connecting the eight hubs with highest concentration of meat and milk (Uvs, Khovsgol, Arkhangai, Bulgan, Ovorkhangai, Tuv, Khentii, and Sukhbaatar). Concentrating services related to processing and handling in the eight hubs would reduce waste and ensure unbroken cold storage. All services associated with animal health and meat production could then be located within the hubs and small-scale mobile abattoirs with regulated activities introduced for each catchment. The hubs would also provide ancillary logistics services and value addition linked to meat, milk,

and leather, such as packaging, and stripping. A central hub at Bagakhangai should be developed into a freight village to take advantage of the proximity to major transport routes for export and domestic urban markets.

2. Infrastructure for urban mobility to support tourism and services sector.

Given that half the population of Mongolia lives in Ulaanbaatar, urban mobility is critical. The government should therefore prepare a comprehensive and integrated program to improve urban mobility to support the potential in the service sector, including tourism. Infrastructure improvements should focus on Ulaanbaatar's 1,190-kilometer road network and develop mechanisms for complete asset management that covers construction, maintenance and operations. In addition to improving the urban transport infrastructure, the institutions and policy framework to create reliable services need to be established. Doing so would include separating policy making from operations and adopting a commercial approach to manage the bus system, creating a viable business model and operator contract structure for bus operators, and implementing an efficient fare policy. To unlock the full potential of tourism, Mongolia needs to improve the road and service links between the new Ulaanbaatar international airport in the Khushig Valley, 52 kilometers south of the capital. This transport infrastructure would allow international tourists to access hotels and tourist sites. The service sector is dependent on digital infrastructure. The backbone digital infrastructure is already in place. Priority should therefore be given to strengthening gaps in Internet capacity and access, improving last-mile connectivity, and expanding 4G connectivity in rural areas. The main challenge is how to tackle associated requirements for digital readiness to harness technological advancements, including (a) increasing accessibility to and the affordability of the Internet, (b) providing financing and talent for digital technology start-ups, and (c) increasing digital literacy among the public. A digital economy strategy and action plan needs to be prepared to support the digital economy.

3. Energy infrastructure and renewable energy for export.

Upgrading, modernization, and expansion will be needed to sustain economic growth and take advantage of regional energy demand. The government will need to upgrade key parts of its energy infrastructure, including aging co-generation plants and overloaded distribution networks. It also needs to invest in new power transmission lines, to meet the growth in demand along key economic corridors, such as Choir-Sainshand and Songino-Baganuur. It should also invest in utilization of its rich renewable energy resources, to enable an energy transition to mitigate the environmental and social cost of coal use. The government should pursue the opportunities for a Russia–China gas pipeline going through Mongolia and seek electrical interconnection with China for power exchange and export of renewable energy in the longer term.

4. Infrastructure for mineral value chains.

Selective infrastructure investments can unlock the latent potential of several mineral value chains. Ultimately, the whole economy benefits as the tax base grows by lifting the infrastructure constraint, which until now has limited mineral value chains to projects that do not rely heavily on infrastructure or are able to absorb the high costs of self-supplied power and dedicated transport. Power infrastructure investments to support the mining value chain will unlock unmet demand from mines and mineral processing for continuous grid-supplied electricity. Only 44 percent of current power consumption by the mining and heavy industries sector is grid-supplied. The 56 percent that is not served from the grid comes from auto-generation or imports from China. The potential to reduce the electricity/operating cost of mining and heavy industries is thus enormous; a huge untapped revenue base comprising mainly creditworthy customers could provide secure long-term offtake. Reliable power can be supplied in return for mines either directly investing in connections to the grid or making payment for supply linked to the avoided cost of having to self-supply or use back-up. The largest mines may prefer to construct their own power supply or to

attract private investment through independent power producer (IPP) schemes, through auctions, in order to generate enough electricity for own use. As far as possible, such generation should be linked to the grid both to allow surplus power to be supplied to the grid and for the mines to benefit from back-up from the grid. For transport infrastructure to support mining value chains government should prioritize the transport sector investments that help enhance the competitiveness of traded goods, generally by selectively piggybacking on rail investments needed for bulk minerals and upgrading the road network as far as possible. The government should reexamine its commitment to finance all planned new railway lines to export coal. Although a shift from road to rail haulage for coal in South Gobi is long overdue and would generate transport cost savings and reduce ecological damage, there are mounting challenges to financing coal infrastructure, especially after cancellation of the Erdenes Tavan Tolgoi's Initial Public Offering. New railway lines for coal should proceed only based on a full life of asset cost–benefit assessment that considers system-wide benefits from interconnections, cost-effective supply of minerals for domestic processing, and opportunities for multiple uses and users. Appropriate weight should be assigned to stranded asset risk. This concern is greatest for thermal coal, as demand for Mongolian coking coal is likely to remain firm in China during the next decade. The prospects thereafter are less certain, as demand for coal-reliant steel-making plateaus.

5. Infrastructure for regional connectivity and trade with China and Russia.

To enhance trade with its neighbors, the central railway line—the backbone for connectivity between Mongolia, Russia, and China—needs to be upgraded but in a phased manner. A full upgrade of the current single-track diesel railway line to a double-track electrified line would cost USD\$7–\$11 billion. This size of investment is not affordable or justifiable to meet current demand. The current rail line, though in relatively poor condition, is capable of handling existing freight volumes with some minor improvements. In a scenario

in which the Tavan Tolgoi coal complex is linked to the central railway line by a new railway line to the existing railhead at Zuunbayan, improved handling services for some 30 million tons of coking coal shifted from road to rail would be needed on the central railway line. Such volumes could underwrite the cost of the improvements needed, especially on sections with speed restrictions. Mongolia has already invested in a Bombardier control system. Together with upgrades to the signaling system and passing loops, it could be the basis for efficient railway services to meet current and imminent demand. The rest of the railway system and infrastructure could then be improved in phases, as freight volumes increase and market confidence in the central economic corridor connecting China and Russia improves.

Second, Mongolia should leverage more private financing for infrastructure, by improving the regulatory framework and investment climate, leveraging large mining investments, and reforming tariffs to create sustainable revenue streams.

- Efforts should focus on reducing the long concessions list to a pipeline of 10-20 well-considered PPP projects with economic value and financial viability and bringing together financially viable projects from other “lists” and departments, such as those projects under CMREC and Erdenes Mongol into one master list of possible investments for private sector participation. Turning the concessions list into a market-facing, credible list of well-prepared projects would help the government redirect its focus to priority projects and pique investor interest. A first step would be to conduct initial screening of the projects in the Public Investment Program (PIP) and selected annual capital projects for PPP suitability. Projects that may be suitable for PPPs would then undergo a rigorous prefeasibility assessment, be market sounded, and, if found to be viable, offered to the market with appropriate risk allocation on

a competitive basis. A moratorium on build-transfer projects, which represent a form of off-budget public financing rather than a true PPP, should continue to be imposed. At the same time, it will be important to reconcile the Law on Concessions, which is generally aligned with international best practices, with the rest of the budget and public investment legal framework, particularly as it relates to project preparation, procurement, and government support for PPPs.

- The government should reassess the policy of holding equity in strategic mineral deposits and associated infrastructure, in order to determine whether it represents an optimal use of scarce public financial resources. In principle, state equity can capture mineral resource rents for the benefit of the country. However, the returns on equity in mining take many years to materialize and are subject to great uncertainty. Equity is financed on a working interest basis, exposing the state to a pro rata share of financing, including cost overruns. Given liquidity constraints, state equity has been financed mainly by borrowing. An exception is the Oyu Tolgoi mine, in which the private partners carry the state’s interest.¹ The Mining Law already includes a provision allowing for royalty payments in lieu of equity, implying that equity is recognized as not always the best way for Mongolia to benefit from its mineral wealth.
- Relying more on the private sector and less on the public sector to develop Mongolia’s mining sector would free up a significant amount of public funds to use on public infrastructure to support diversification of the economy. Better access to reliable public infrastructure could lower mining costs and increase mining profits and associated royalty and income tax payments, and the infrastructure could still earn a reasonable rate of financial return from user fees. Privately financed mining projects could potentially contribute to building shared

¹ The private parties pre-finance the state’s share, recovering it from the state’s dividend entitlement. This system relieves the government from having to directly finance its share.

infrastructure, which is open to multiple use and users, based on the avoided cost of building dedicated infrastructure.

- At a minimum, pending any change to its mandate as part of a revision of the state equity policy, it is important for Erdenes Mongol's plans for identifying, selecting, and financing infrastructure projects to be fully integrated into national planning of infrastructure.
- The government should develop policies and regulatory instruments that promote advance planning of mining infrastructure with stakeholders and maximize the scope for such infrastructure to be shared. It must continue to work on improving the investment climate for foreign investors, including by maintaining liberalization of sectors with private sector interest, respecting the sanctity of contracts, and ensuring the stability of the legal regime.
- The government should carry out energy pricing reforms to increase efficiency, lower the cost of service delivery, and attract private investment to the sector.
- To address institutional fragmentation, a central unit composed of experienced staff could play a project screening, coordinating, and steering role with different parts of governments, with ultimate approvals remaining the responsibility of the Ministry of Finance. In countries such as the United Kingdom, an equivalent entity (the National Infrastructure Commission) is housed in the Department for Treasury (the equivalent of the Ministry of Finance). All options would have to be examined, but the principle is to enable coordinated planning for strategic infrastructure. This would also achieve the goal of streamlining the process of identifying, selecting, prioritizing, and delivering, critical infrastructure. Such a unit would also support targeted capacity building and encourage assignment of the right staff to important projects. However, in line with international best practice (as in Chile and the United Kingdom), the Ministry of Finance should play a key "gatekeeper" role in approving, especially projects requiring large fiscal outlays.

Third, Mongolia should overcome institutional fragmentation in the selection and approval process for key infrastructure investments, including with respect to the strategic Trans-Mongolian corridor.

- To enhance Mongolia's strategic position between China and Russia, the government needs to design a more operational institutional framework for promoting the Trans-Mongolian corridor. The design should include specific mechanisms for regional traffic observation, marketing of the corridor, unclogging logistics and trade facilitation bottlenecks, and addressing challenges of interoperability given the differences in railway systems. How this infrastructure, which would benefit all three countries, is financed needs to be addressed as part of CMREC.



The Role of Infrastructure in Mongolia's Development

- 1.1 Overview
- 1.2 What Makes Mongolia Unique?
- 1.3 Infrastructure and Mongolia's Development Challenges
- 1.4 Toward Selectivity: Key Value Chains in Mongolia
- 1.5 Toward Selectivity: Regional Connectivity and Potential Linkages

1 THE ROLE OF INFRASTRUCTURE IN MONGOLIA'S DEVELOPMENT

1.1 Overview

The purpose of this InfraSAP is to prepare an evidence base and framework for developing Mongolia's economic corridors and the domestic infrastructure required to diversify the economy and improve its competitiveness. The World Bank Group's InfraSAPs provide analytics aimed at leveraging all sources of funding, finance, expertise, and solutions to develop the infrastructure needed to achieve the Sustainable Development Goals. InfraSAPs are developed within the World Bank Group's overarching agenda of Mobilizing Finance for Development (MfD). The aim of MFD is to crowd in investment resources beyond national budgets and support from concessional sources. InfraSAPs also seek to leverage expertise across arms of the World Bank Group to understand how infrastructure

can support drivers of economic growth while addressing intersection with pressing social and environmental issues. In the case of Mongolia, this includes the World Bank Group's expertise in transport, energy, digital development, agriculture, extractives, public investments, private financing, and macro-fiscal management.

As of June 2020, the World Bank Group had completed or was in the process of undertaking 20 InfraSAPs. Within this broader group, Mongolia's InfraSAP is unique, primarily because of the country's demographic and spatial challenges, the configuration of its economy and macro-fiscal conditions, its vast natural resources, and its geographical location between China and Russia. For this reason, unlike other InfraSAPs, the Mongolia InfraSAP includes strong detailed analytics on the primary target sectors framed by these four features.

Box 1.1 Scope of the Mongolia InfraSAP

This Mongolia Infrastructure Assessment Program (InfraSAP) Report provides an assessment of Mongolia's prospective economic growth drivers. It uses a value chain approach to help identify areas and sectors of focus as well as priority infrastructure gaps and investments to support these growth drivers. The report also makes recommendations on key policy reforms and institutional and financing approaches to address the priority infrastructure gaps identified.

Three questions guide the Mongolia InfraSAP:

1. What energy, transport, and digital infrastructure is needed to support specific drivers of growth?
2. How can this infrastructure be financed and funded?
3. What policy, institutional, and regulatory reforms would accelerate the impact of infrastructure on economic diversification and connectivity?

The report is organized as follows. Chapter 1 provides context by exploring the value chains that have potential to accelerate economic growth in Mongolia given the challenges of distance, density, and geography. A key theme running through the report is the need for selectivity. Therefore, this chapter provides a diagnosis of these value chains and an assessment of the gaps in five strategic value chains: value added mining, the livestock value chain, tourism, digital development and the service sector, and renewable energy for export. It also discusses selectivity in relation to regional connectivity. Chapter 2 discusses how and why infrastructure is a major constraint to Mongolia's economic development and highlights the challenges of the current infrastructure stock in terms of quality, capacity, and coverage. Chapter 3 discusses the role of policies, institutions, and financing in closing the infrastructure gap. Chapter 4 introduces the value chains approach and discusses in detail the infrastructure required for the strategic value chains. It explores what infrastructure and infrastructure for what. Chapter 5 provides recommendations for investments and interventions in specific value chains.

1.2 What Makes Mongolia Unique?

The need for this InfraSAP and the approach adopted is prompted by a unique set of circumstances and challenges that Mongolia faces. First, Mongolia is the least densely populated country in the world. With just over 3.2 million people inhabiting a territory of 1.564 million square kilometers (more than six times the size of the United Kingdom and less than a third the population of London), Mongolia has a population density of 2.1 people per square kilometer. About half the population - some 1.4 million people - live in the capital city Ulaanbaatar. The rest of the population is spread across small urban centers and vast steppes, where people herd sheep, goats, horses, cattle, yaks, and camels. Some 233,000 households in Mongolia own and raise more than 70 million head of livestock. Nearly 30 percent of Mongolians are traditional

nomadic pastoralists whose livelihoods are still vulnerable, with livestock often their only source of income. Alternate job opportunities are scarce in rural areas.

Second, as a landlocked country between China and Russia, Mongolia relies heavily on its relationships with its two powerful neighbors.

China is Mongolia's largest foreign investor and trading partner, with more than 90 percent of Mongolian exports going to China (primarily copper, coal, and gold). Mongolia also strives to advance its bilateral economic and trade relations with Russia. In 2014, the three countries formalized their intentions to forge closer economic ties and develop infrastructure and industrial projects through the China-Mongolia-Russia Economic Corridor (CMREC). The agreement has not yet yielded tangible results.

Third, led by the mining sector, the Mongolian economy experienced rapid yet volatile growth over the last 15 years.

Exploitation of abundant mineral resources, including coking coal, copper, iron ore, and gold, led to a doubling of the country's GDP in 10 years, shifting the country's traditional agricultural economy to a largely mining-driven economy. Once fully developed, the Oyu Tolgoi (OT) copper and Tavan Tolgoi (TT) coal mines will be among the largest mines in the world. Total proven reserves are valued at about \$1 trillion, but the ultimate value could be much higher as new deposits are discovered. In 2019, mining accounted for 24 percent of GDP (up from 11 percent in 2000), 90 percent of exports, and 24 percent of fiscal revenue. Foreign Direct Investment (FDI) inflows are concentrated mainly in the mining and related sectors.

High dependence on mining as the main economic driver has made the economy highly susceptible to external shocks and contributed to boom-and-bust cycles.

Commodity boom-and-bust cycles have occurred in Mongolia every four to five years since 1992, exacerbated by inappropriate procyclical fiscal policies and leading to macroeconomic instability, two recessions, and six International Monetary Fund (IMF) programs (including the current Extended

Fund Facility). Mongolia's economy grew at an average rate of 14 percent during 2011-13, supported by strong mineral exports, FDI, and an expansionary fiscal policy. The economic boom ended abruptly from 2014, however, as a result of a deteriorating external environment marked by declining commodity prices and slowing demand for commodities, especially coal from China.² Real GDP growth fell to 2.4 percent in 2015 and 1.2 percent in 2016. On the demand side, private investment was severely affected as FDI inflows dried up to less than 2 percent of GDP in 2018-19, down from 40 percent of GDP in 2011, as a result of the delay in new mining projects. Private consumption also contracted, as rising unemployment reduced household incomes.

The government responded to the economic slowdown with higher - and ultimately unsustainable - public spending, which led to a rapid rise in public debt and declining investor confidence. Aided by an IMF program, favorable global commodity prices, fiscal discipline, and strong recovery in private investment, Mongolia's economy had begun to grow out of the fiscal and financial problems that started in 2014. GDP growth (at constant factor prices) reached 7.2 percent in 2018, up from 5.3 percent in 2017 and 1.2 percent in 2016. The government also made significant progress on government debt, though it had not yet achieved the IMF's targets. Banking sector reforms have stalled, however, some of the social security reforms have been rolled back, and external buffers have not been adequately built. By the time it was hit by the COVID-19 shock, Mongolia's economy had already started to slow down, and macro vulnerabilities had been accumulating.

Based on the experience of boom and bust, the government of Mongolia has prioritized economic diversification and regional development to avoid the impacts of overdependence on mining.

The key development strategies-set out in the *Three-Pillar Development Policy* of 2018 and the *Mongolia Sustainable Development Vision 2030*-have the goal of diversifying the economy, mainly through development of livestock agriculture and tourism. The Government's Action Plan 2016-2020 outlines the promotion of sustainable growth by improving the business and investment environment; supporting infrastructure development; and implementing national programs to support the food, agriculture, and light industry sectors. Recent increases in poverty as a result of previous economic volatility, perceived increases in inequality, and patchy public services have left the public questioning the real impact of mining revenues on people's livelihoods despite gains in per capita income. As reinforced by the recently approved *Mongolia Vision 2050*, the government is keen to chart a path to economic growth that does not rely solely on mineral wealth to achieve sustainable and inclusive development. The World Bank Group's Systematic Country Diagnostic 2018 identified reducing dependence on mineral wealth as one of the three main challenges facing Mongolia (the other two were the well-being of vulnerable people and the growing environmental stress).

A key ingredient that is missing and urgently needed in the growth and recovery agenda is coordinated and comprehensive assessment of infrastructure that takes account of Mongolia's economic growth aspirations and the unique demographic and physical features. This InfraSAP seeks to fill this gap.

² Global prices of copper and coal, the main export commodities of Mongolia, dropped by about 25 percent and 32 percent respectively, between 2013 and 2015. The volume of coal exports shrank by 21 percent over the same period.

1.3 Infrastructure and Mongolia's Development Challenges

Poor infrastructure connectivity resulting in underperforming economic corridors inhibits diversification of the economy and competitiveness of sectors with growth potential. Mongolia's agriculture sector, specifically wool, cashmere, and meat, has underperformed relative to the country's comparative advantage, partly because of the underdeveloped economic corridors that link herders with international markets. Difficult access to energy networks, together with poor transport connectivity, has hindered efficient logistics and storage, resulting in significant waste. Information and communications technology (ICT) coverage is good, but many Soum centers do not have reliable phone nor Internet coverage, which would enable remote herders to access wider markets. More coordinated and integrated investment in infrastructure and non-infrastructure interventions along key economic corridors could increase the potential for various productive sectors of the economy. As shown in photo 1.1, poor infrastructure is a major constraint to economic growth in Mongolia.

Poor infrastructure provision has also resulted in suboptimal development of mineral value chains.

The gap between Mongolia's famed mineral riches and actual investment in exploration, mining, and adding value to minerals is large and growing. Development of mineral deposits has been restricted only to a few developers and to mines with limited infrastructure needs or the few that can absorb the high costs imposed by having to internalize the costs of reliable infrastructure. Value addition through processing of mined ore in-country, in place of direct export, is constrained either by a limited resource base or the high costs of infrastructure relative to markets of sufficient scale.

Optimal development of mineral value chains supported by targeted infrastructure development can grow the tax base in Mongolia. Opportunities to grow the tax base include improving margins for existing mines and attracting more and new entrants and value added to minerals through processing. The mining sector could also anchor the financing of infrastructure to generate public benefits, investing in a more robust energy grid and improved rail network, for example. Additional benefits include indirect



Photo 1-1.
Poorly developed infrastructure systems are a constraint to growth.

and induced consumption and investment effects through supply chains and the labor force. However, public policy must mitigate the macroeconomic risks of continued high levels of dependence on minerals and the ecological risks of a larger mining and mineral processing sector.

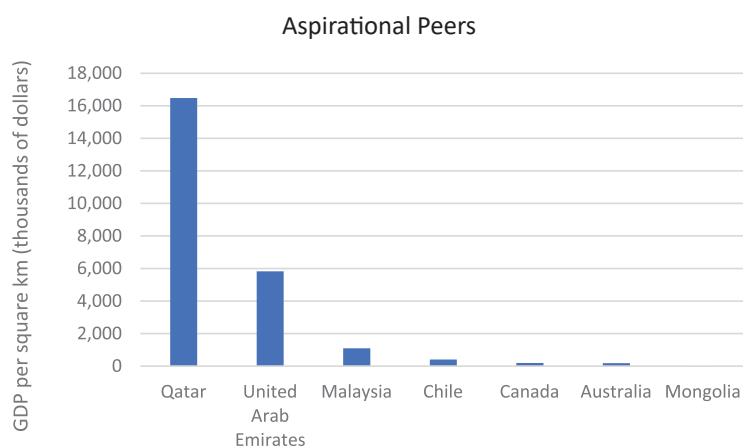
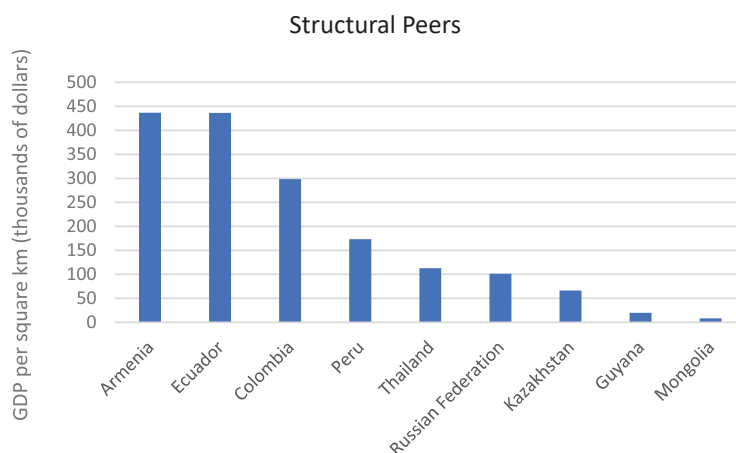
From a geospatial perspective, Mongolia is comparable to Australia and Canada, which are also large and have vast mineral resources. Both countries have been able to develop the infrastructure needed to support economic growth and have used their natural resources to support economic growth. In contrast, Kazakhstan, which has similar density to Mongolia, is only beginning to realize the benefits of being well endowed with natural resources.

The infrastructure challenge is captured in the performance of Mongolia on various parameters. Figure 1.1 shows that GDP output per square kilometer in Mongolia is low in comparison with peers. This means that the demand-side challenges that Mongolia faces require careful planning and associated financing for the most optimal infrastructure.

Considering the issues on the supply side, the situation in Mongolia is equally challenging as shown on the Comparisons of *Logistics Performance Index, Connectedness* (Figure 1.2) and the overall *Global Competitiveness* (Figure 1.3) illustrate Mongolia's difficult position. The country compares poorly with most countries; only Ecuador has a lower

Figure 1.1

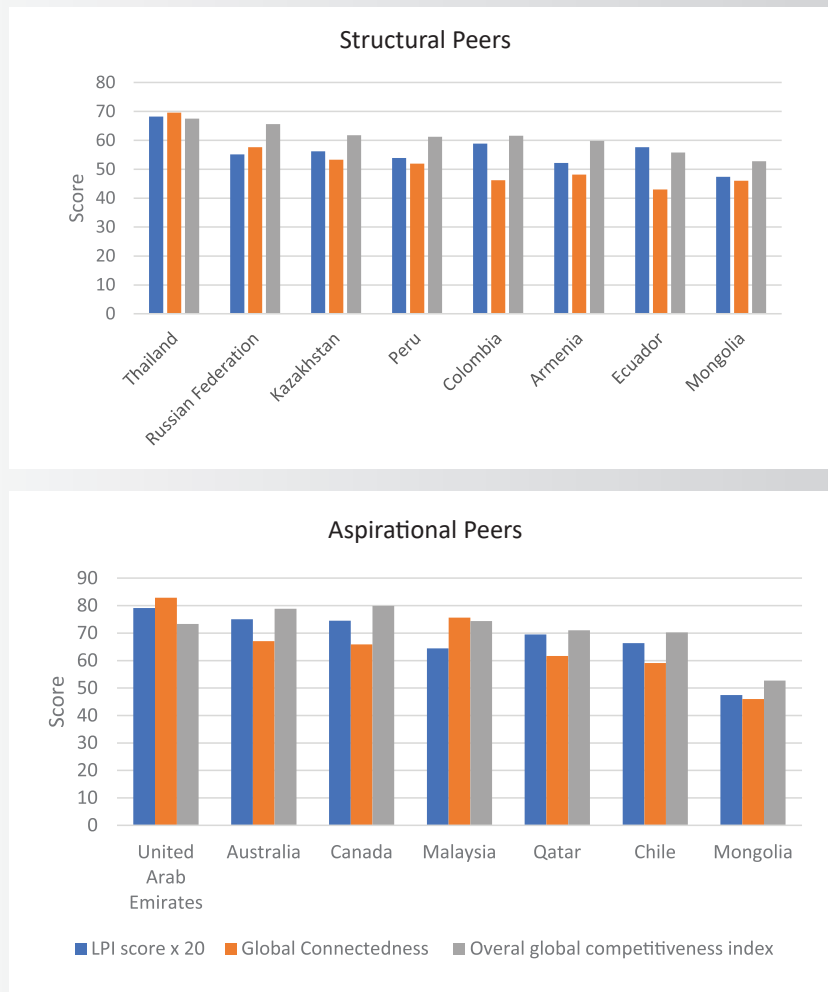
GDP per square kilometer of selected countries, 2018



Source: World Bank, 2018

Figure 1.2

Comparisons of Logistics Performance Index (LPI), Connectedness and Competitiveness, 2018

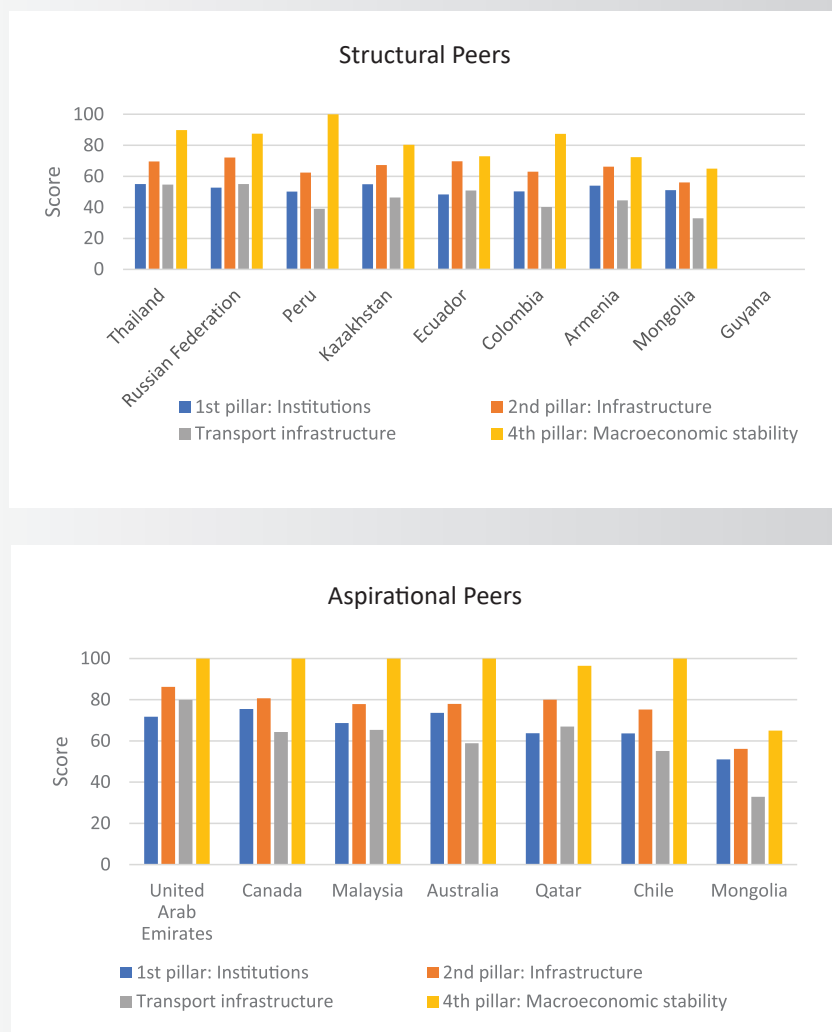


Source: World Bank, 2018

connectedness index. Mongolia has a young and relatively well-educated population and therefore the foundation to develop logistics capabilities, provided that the necessary policy support is available. Given the country's spatial and demographic characteristics, however, connectedness is a challenge in Mongolia. An approach that is highly selective and develops critical infrastructure will increase this important score and make the country more competitive.

Institutions, infrastructure, and macroeconomic stability are considered most important among the various factors that affect competitiveness.

Comparison with other countries highlights the poor condition of transport infrastructure in Mongolia, which is nearly nonexistent compared with the rest of the world. Growth without major investments in infrastructure seems impossible, but funding challenges mean that these investments will have to be highly efficient. It also means that borders must be easy to cross, which would improve the efficiency of export infrastructure and connectedness for Mongolia (Figure 1.4).

Figure 1.3**Competitiveness of selected countries, 2018**

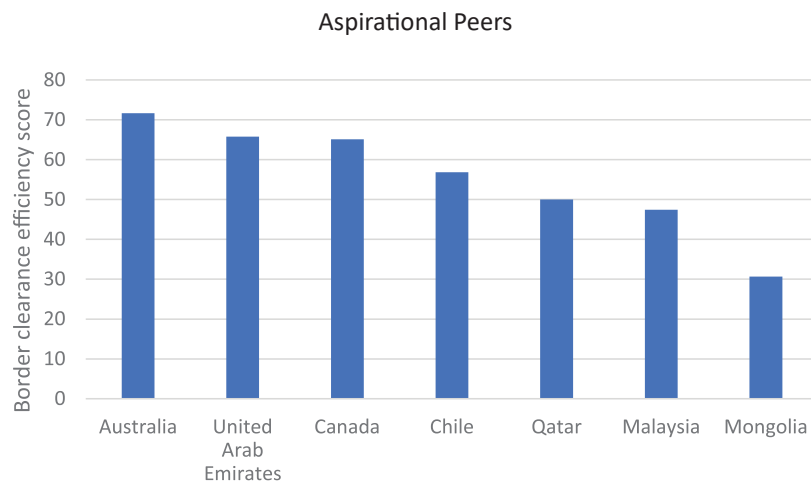
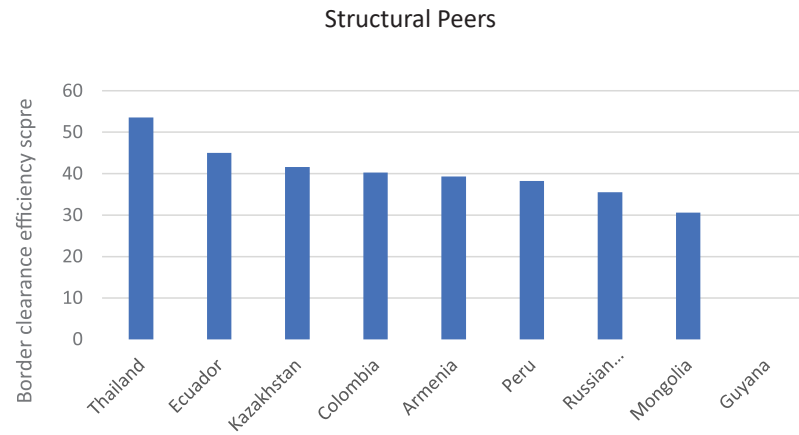
Source: World Bank, 2018

Geospatial challenges mean that Mongolia needs a more sophisticated and evidence-based approach to developing critical infrastructure. Mongolia does not perform poorly on access to infrastructure; the fact that most people live in three urban areas makes them relatively easy to reach. The key constraint is therefore on the development of economic opportunities. The more dispersed the factors of production in a country, the larger the transport cost will be to reach a given level of productivity. Infrastructure is also a very important driver of logistics cost, which can increase trade costs if it is inadequate.

In addition to improving its domestic infrastructure, Mongolia also needs to improve infrastructure for regional connectivity. Doing so requires addressing soft and hard bottlenecks. As a landlocked country, Mongolia is dependent on its neighbors to access international markets. Each of the CMREC countries seeks to benefit from the development of the economic corridor. There are growing concerns among the public and thought leaders about the agreement's effect on the balance of trade and transit freight. Therefore, Mongolia's participation in CMREC needs to be carefully planned to mitigate the potential negative effects on its economy.

Figure 1.4

Border clearance efficiency of selected countries, 2018



Source: World Economic Forum, 2018

1.4 Toward Selectivity: Key Value Chains in Mongolia

Due to the unique spatial and demographic characteristics and its funding and financing constraints, Mongolia needs to be selective about the value chains it can develop to underpin growth and economic diversification. The following sections discuss the value chains that have potential and lays the framework for identifying infrastructure requirements to unlock that potential.

1.4.1 Mineral Value Chains

Although Mongolia is endowed with significant quantities and a diversity of mineral resources, their development has been suboptimal; opportunities remain to increase value and diversify the economy. The gap between Mongolia's famed mineral riches and actual investment in exploration, mining, and adding value to minerals is large and growing. Development of mineral deposits has been restricted only to those with limited infrastructure needs or the few that can absorb the high costs imposed by having to internalize the costs of building dedicated infrastructure. Value addition

through the beneficiation of ore at the mine site and further processing in-country, in place of direct export, is constrained by a limited mineral resource base or the high costs of infrastructure relative to markets of sufficient scale. Public policy has failed to alleviate such conditions. Indeed, it has often exacerbated them through uncertainty, driving up the risk premium associated with investment in Mongolia. A by-product has been damage to the ecosystem as a result of poor infrastructure planning (off-road trucking, diesel power generation) and the prevalence of low-cost and/or irresponsible mining methods by undercapitalized firms. Photo 1.2 illustrates challenges with mining in Mongolia.

Given Mongolia's mineral resource endowment, which for some minerals could support mining for many decades, there has been strong interest in how much of the value chain between mineral extraction and final value-added products can be retained in Mongolia. As in most mineral-rich countries, the government is keen to maximize this potential and challenge investors to consider it when deciding to mine. In principle, it would be advantageous to keep the entire mineral value chain within the country's borders and capture the entire value. Many factors - related

Photo 1-2.
Combination of poor infrastructure and sub-optimal development of mining resources.



to mineral type, technology, access to other raw materials, product markets, trade regulation, and infrastructure - usually make it impossible to do, however. If such constraints can be overcome only at very high cost, it may turn out that what was motivated by a prospect of value addition turns into value destruction.

Previous reviews of opportunities to add value to minerals in Mongolia have concluded that some minerals present better opportunities than others. Several projects have been investigated, by the government or project proponents, including existing miners. In some cases, the quest for value - adding investments has led to projects that were previously not economically viable. Examples include the coal-washing plant at the Mongolian Mining Corporation's coal mine in the Tavan Tolgoi coal complex, production of refined copper on a small scale by Erdmin from copper concentrates supplied by Erdenet, and several investments in dry or wet magnetic separation of iron ore at mines in the north near Darkhan. Many more options have been investigated, but none has demonstrated feasibility or been able to secure financing.

Lack of infrastructure may not always be the primary factor driving a lack of feasibility, but it is a significant constraint in many cases. Energy-intensive processes for converting minerals into higher-value products, including refined metals, require large volumes of uninterruptible power. Globally, there is a tendency for the most energy-intensive metal processing to take place where electricity supply is cheap and reliable. Transport is a significant cost factor when processing takes place far away from the mine, especially for bulk minerals such as coal and iron ore. In Mongolia's more arid areas, especially in the South Gobi Region, lack of surface water and a risk of overdrawing groundwater are major challenges.

The following sections summarize past assessments of opportunities to develop mineral value chains for the main minerals produced in Mongolia.

1.4.1.1 Coal

Mongolia has abundant coal resources, sufficient at current levels of exploitation to last many decades. In the past, most coal produced was thermal coal for domestic use in power generation from mines developed in the 1980s and 1990s, such as Baganuur and Shivee Ovoo. Production was about 5 million tons a year. Beginning about 2008, coal production increased to meet the fast-growing demand for coking and thermal coal in the neighboring industrial regions of northern China. Several new mines were brought into operation, especially in the Tavan Tolgoi and Nariin Sukhait coal complexes in the South Gobi Region, which are rich in coking coal.³ Coal production and exports grew rapidly. In 2019, exports were 36.4 million tons, with state-owned ETT accounting for 43 percent. Coking coal, which is used in steel mills, has been the main product sought by Chinese buyers. China imported 75 million tons of coking coal in 2019, half of it from Mongolia.

Although coking coal has been Mongolia's leading export product for over a decade, limited progress has been made to overcome severe obstacles to competitiveness. Mongolian producers have made only limited progress in adding value by upgrading coal at the mine site and still rely on road haulage rather than lower cost rail. As a consequence, producers' operating margins have been vulnerable to fluctuating prices of coal on world markets. Moreover, being captive suppliers to the Chinese market has made it difficult to secure access to China on favorable terms. These conditions have made it difficult to plan and finance important coal mine, processing, and infrastructure investments.

Producers can add value to coking coal by sorting and washing it at the mine to remove waste and ash (Table 1.1). Doing so yields a saleable product that is about two-thirds of raw coal by weight and commands a price premium of some 25-30 percent over raw coal. However,

³ New mines included Ovoot Tolgoi in 2008, UHG in 2009, ETT in 2011, and Baruun Naran in 2012.

Table 1.1 Value-addition options for coal

Raw material	Washing	Coke conversion	Steel mills	Power generation
Coking Coal	<ul style="list-style-type: none"> • Conversion of run-of-mine coal to an upgraded product • Mine site coal preparation plant • High energy requirement • High water requirement 	<ul style="list-style-type: none"> • Conversion of coking coal to coke • Mostly steel plant site • High energy requirement • Emit gas and toxins 	See section on steel value chain	n.a.
Thermal Coal		n.a.	n.a.	See section on power

Source: World Bank.
Note: n.a. Not applicable.

a washing plant consumes large quantities of water and is the most energy-intensive activity at the mine site. For thermal coal, sorting and washing of some types of coal can add value, although power plants can use a variety of coal types. Just 15 percent of coal exports by volume were washed in 2018, notwithstanding plans by nearly all coal mines to build washing capacity.⁴ The entire output of leading coal producer ETT is still exported without washing.⁵ The main barriers to washing have been the high capital costs of building plant, power, and water facilities and difficulties in raising the requisite finance.

Value addition can be enhanced even more by investing in coke plants in which the gas content of coal is liberated to produce coke, which is charged to blast furnaces at steel mills. This investment more than doubles the product value. Investment in coke-making plants is costly, however, and generates high levels of air pollution. Lessons from China and Russia demonstrate the significant health impacts imposed on communities, including respiratory disease and physical deformities.⁶ Steel-making using direct reduced iron offers an alternative to the use of coke. A few small coke plants sprung

up close to the border with China as coal exports began to grow and a project Memorandum of Understanding exists for a large coke - and steel-making investment by Erdenes Steel and a Chinese investor.

Major mining-related transport investments have been driven by the need to reduce unit costs of transport to export markets for coal, another way to improve mines' operating margins. Routes have been selected to serve mining areas, especially in South Gobi, and deliver coal to the nearest border crossings convenient for connection with existing rail transport into Inner Mongolian industrial areas and beyond. This has led to a progression from unsealed roads to sealed roads for most export volumes. The amount of coal exported by Mongolia to China has now surpassed 30 million tpy, a threshold at which transition to rail would yield significant cost savings. A study undertaken by the Asian Development Bank in 2018 using mineral export data over the six preceding years estimated that there could have been fuel savings worth over \$100 million annually (\$634 million in total) had rail transport been in place.⁷ A calculation that took account of environmental externalities

⁴ EITI Report 2019. The Mongolia Mining Corporation was the first company to invest in a washing plant, at the UHG mine in the Tavan Tolgoi coal complex, in 2011. The 10 million tpy unit is powered by an 18 MW power plant. A small portion of the coal produced by South Gobi Resources at its Ovoot mine in the Nariin Sukhait coal complex is also washed, but a full-scale washing plant was never built. The thermal coal mine at Sharyn Gol, which mainly supplies the domestic market, commissioned a washing plant in 2015.

⁵ ETT originally planned to build a washing plant by 2014. It now plans to build a \$600 million coal preparation plant and a water supply pipeline (over 70 kilometers) in three phases between 2021 and 2023, to be able to process up to 30 million tpy of raw coal. This investment is linked to the planned installation of a 450 MW power plant to serve the mine and washing plant at Tavan Tolgoi and sell power to Oyu Tolgoi mine.

⁶ Mongolia Industrialization, Worley Parsons, 2010.

⁷ Breaking Barriers-Leveraging Mongolia's Transport and Logistics Sector, ADB, 2018

would have demonstrated even greater savings. Nevertheless, in 2019 no coking coal was exported to China by rail, and the soonest it might happen is 2021, but only if two rail projects launched by the government in 2019 are fully financed.

1.4.1.2 Copper

Mongolia has been mining copper since the late 1970s, when Erdenet was brought into operation. At the time, it was one of the largest copper mines in the world. The proven mineral reserves will support production for several more years, and the resource base could support an extended mine life. Output is mainly copper concentrates for export. Processing of copper at Erdenet is limited to retreatment of low-grade copper dumps using a Solvent Extraction Electro Winning (SX-EW) plant to produce up to 3,000 tons of pure metal (99.999 percent copper). Erdmin, a subsidiary which was set up in 1994, produces copper in this way; it accounts for less than 5 percent of Erdenet's output. The last major expansion of mining operations at Erdenet was completed in 2000; investment has been limited in recent years to de-bottlenecking. Changes in the ownership structure of the company in 2016, through which the 49 percent Russian held interest was divested, resulted in legal disputes and put off plans for the expansion in mine throughput (from 26 to 35 million tpy of ore) that is needed to offset declining copper grades.

No other copper mining took place in Mongolia until the discovery of a world class copper-gold deposit at Oyu Tolgoi (OT) in the South Gobi region in the early part of the century. Most of the valuable ore is at considerable depth. A two-phase plan emerged in which mining would start by open pit to access near surface copper-gold ore, followed some years later by a larger and more expensive underground mine. OT came into production in 2013, with an expected mine life of over 50 years. The scale and quality of the

OT mineral resource is such that it was possible to develop a mine, notwithstanding the remote location and complete lack of infrastructure. In the period preceding first production, OT financed investment in a transmission line and substation for receiving power from the Inner Mongolia grid in China and a sealed road running south to the border crossing at Gashuun-Sukhait. Transport by rail has not been considered, as the volumes shipped are below the threshold at which a dedicated rail line would make economic sense.

The launch of OT generated significant interest in the potential for further discoveries of its type in adjacent areas. Several companies have at one time or another undertaken exploration.

Although there are promising signs that exploration could eventually lead to more mines, until now, with one exception, projects are at the advanced exploration stage and not yet at prefeasibility, let alone the full bankable feasibility stage.⁸ The Business Council of Mongolia has suggested that the main constraints on further development of copper resources in the South Gobi region are less about technical issues and more about the poor investment climate.

The value chain for copper typically contains valuable co-products or by-products and requires mine site processing to be converted into a saleable form (Table 1.2). A process of milling converts crushed ore into a pure copper concentrate or more typically a concentrate combining copper with gold, molybdenum, and a variety of minor but valuable metals, depending on the mineral deposit type.

Given the scale of planned copper mine production, there has always been interest in adding value to copper concentrates in-country by smelting and refining and further copper product manufacture. Conventional copper smelting and refining are used to convert concentrate into pure metal while separating out and recovering other valuable metal by-products.

⁸ Construction of the Tsagaan Suvarga copper-molybdenum mine began but was halted after the owner was unable to secure all the financing needed. The total project cost is over \$1 billion.

Table 1.2 Value-addition options for copper

Stage	Option for value addition
Raw material	Copper ore (typically, less than 3 percent of ore)
Concentration	Conversion to a product containing 20-35 percent copper Moderately energy intensive Highly water intensive Moderately bulky product Waste (tailings) management needed
Smelting	Conversion to metal rich anodes Highly energy intensive High cost Pollution abatement needed
Refining	Conversion to pure copper cathodes (99.999 percent) by electrolysis Highly energy intensive High cost Pollution abatement needed
Semi-manufacture	Conversion by extrusion, rolling or forming into copper products

Source: World Bank.

These plants are typically large and high-cost facilities that consume large quantities of water and power. Under the right conditions, copper smelting and refining can deliver significant value addition. A variety of copper metal products can be made (called semi-manufactures) by extrusion (wire), rolling (sheet) and forming (bars and other shapes). In 2010, the government commissioned a study to examine value-addition options for Mongolia's strategic mineral deposits.⁹ It concluded that it would be possible to develop a copper value chain in Mongolia in which smelting and refining would take place at each of the main copper mines to avoid the costs of transporting concentrates to a separate location.

Other options considered are for smelting and refining to take place at a location already served with power and rail transport and with potential for industrial spin-offs, using copper concentrates from more than one source (such as Erdenet, OT, and eventually Tsagaan Suvarga). In 2015, the National Assembly was informed that copper smelting and refining would take place at Bor-Undur, near Sainshand. The government is thought to be investigating this option further, but the National Security Council has assigned a

national security ban on disclosing information about this project.

1.4.1.3 Iron ore

Mongolia has a few medium-size deposits of iron ore (reserves of more than 30 million tons of ore) and numerous small magnetite deposits, which vary significantly in quality. Until the 1990's, little interest was shown in these deposits. Interest grew when rapid growth of demand for iron ore in China's steel sector drove prices up, prompting a scramble to convert known iron ore deposits into mines. Easy to mine surface deposits with high grades presented relatively low entry barriers for investors, and buyers in China were prepared to receive direct shipping ore (DSO) and blend it with other iron ore. High prices between 2010 and 2013 for high-grade material justified the cost of transport by road to a railhead and then over 1,000 kilometers to Chinese steel mills. Iron ore production increased from negligible amounts in the 1990s to over 11 million tpy in 2017 (Table 1.3). Although this production provided a welcome boost to export revenues, even at peak levels in 2013 iron ore never reached more than 15 percent of

⁹ Worley Parsons, 2010.

Table 1.3 Iron ore output in Mongolia, 2011-18 (million tons)

Year	Total iron ore	Processed iron ore
2011	5.7	-
2012	7.6	-
2013	11.1	6.1
2014	10.3	4.0
2015	6.2	1.9
2016	7.1	2.2
2017	11.4	3.7
2018	9.6	3.4

Source: EITI Reports.

total mineral export value. Most production has come from the mines clustered in the north near Darkhan, especially in Selenge *Aimag*.

Like coal mines, iron ore mines can improve the value of the product shipped to buyers if iron ore extracted from the mine undergoes concentration, typically by means of magnetic separation, which can be done by using a dry process or the more expensive wet process (Table 1.4). The residual iron content once waste has been separated out is improved and the volume that needs to be shipped reduced. As an example, Eruu Gol's dry magnetic separation plant upgrades iron ore grading 35 percent FE to some 58-62 percent FE, and its wet magnetic

separation plant yields 66 percent FE. A further step is to convert upgraded iron ore into pellets that are convenient to handle and transport and have improved melting properties in the steel mill.

Some iron ore mines in Mongolia continue to sell DSO, but most have installed dry magnetic separation. Only a few have taken the further step of wet magnetic separation, for which the capital costs are greater, power needs are higher, and access to water is essential. None of the mines has invested in palletization. DSO captures about 10 percent of the final steel price in the value chain; full mining beneficiation into pellets captures about 22 percent of the final steel price

Table 1.4 Value-addition options for iron ore

Raw material	Iron Ore (wide range of grades from 10 - 50 percent) Approx. 50 percent of pellet prices and 10 percent of finished steel prices
Concentration	Conversion of unprocessed iron ore into a concentrate Dry or wet magnetic separation High power requirement (100 MW to treat 10 mtpy of unprocessed iron ore) High water requirement for wet process
Pelletizing	Conversion of concentrate into pellets 22 percent of finished steel price Very high-power requirement (200 MW to treat 7 mtpy of iron ore)

Source: World Bank; Worley Parsons 2010.

in the value chain. The advantage enjoyed by iron ore miners, at least in the north, is their proximity to the Trans-Mongolian Railway south to China. Several mines are within 30-90 kilometers of the nearest railhead, allowing for relatively short-haul road transport. Two rail lines have been built, an 85-kilometer line from privately owned Eruu Gol, the largest of the mines, and a 34-kilometer line from Tumurtei, belonging to state-owned DMC, which was commissioned in 2016 with supply to DMC's steel mill in mind.

The distance to the Chinese market and the terms available to access space on the Trans-Mongolian Railway have kept costs to deliver iron ore high and put pressure on the margins of Mongolian mines. Rail transport to the Chinese border adds some \$17/ton to the cost of delivering iron ore on top of mining costs of about \$20-\$35/ton (based on the rail tariff of \$0.015/ton/kilometer) (ERI 2017). Mongolian suppliers compete with iron ore produced in Inner Mongolia and increasingly competitively priced imports from Australia, South Africa, and Brazil. The iron ore boom faded after 2013, when iron ore prices started falling, prompting some Mongolian iron ore mines to shut down (the

number of operating mines declined from nine to five by 2015) and limited the ability to invest in mine site beneficiation. One consequence of the marginally economic character of iron ore mining in Mongolia is that there has been little investment in exploring the iron ore resource base.¹⁰ In addition, iron ore deposits are held under numerous licenses by different owners. There has been limited opportunity to consolidate these holdings and develop a region-wide program for optimizing mining and infrastructure. This factor weighs heavily in considering the opportunity to develop a steel value chain.

1.4.1.4 Steel

As Mongolia is very well endowed with coking coal and has iron ore, the opportunity to develop a steel value chain has been of interest to both the government and some project proponents. Considerable effort has gone into evaluating the techno-economic foundation for developing steel-making capacity to take advantage of the availability of raw materials. Much of this effort has focused on the small-scale steel works in Darkhan, which rely on scrap metal feed rather

Table 1.5 Value-addition options for steel-making

Raw Material	Direct Reduction	Steel Conversion	Steel Manufacture
Iron Ore and Coking Coal	n.a.	Conversion of iron ore in a conventional blast furnace into steel	Conversion of steel into steel products, such as steel sheet High power requirement (120 MW to treat 1 mtpy of steel)
Iron Ore Pellets and Coal Approximately 20 percent of finished steel prices (not product prices) ¹¹	Conversion of iron ore and coal into Direct Reduction Iron High power requirement (80 MW to treat 1 mtpy of pellets)	Conversion of DRI and scrap iron into steel in an Electric Arc Furnace High power requirement (100 MW to treat 0.6 mtpy of DRI and 0.4 mtpy of scrap)	

Source: World Bank; Worley Parson 2010.

¹⁰ The government states that only 42 percent of the country's mineralization has been explored. Land holding under exploration licenses in 2020 stands at little more than 2 percent of Mongolian territory.

¹¹ Worley Parsons, 2010; Twerefou, D., 2009. Mineral exploitation, environmental sustainability and sustainable development in EAC, SADC and ECOWAS Regions, African Trade Policy Center Work in Progress. p26.

than iron ore. Scrap supply sets a boundary on the scale of operation to some 35,000-45,000 tpy of steel, less than 10 percent of domestic steel consumption. The steel value chains shown in Table 1.5 shows the two main options for producing steel, one using the conventional blast furnace route of reducing iron ore with coke and the other using direct reduction iron (DRI) in an electric arc furnace using gas or coking coal.

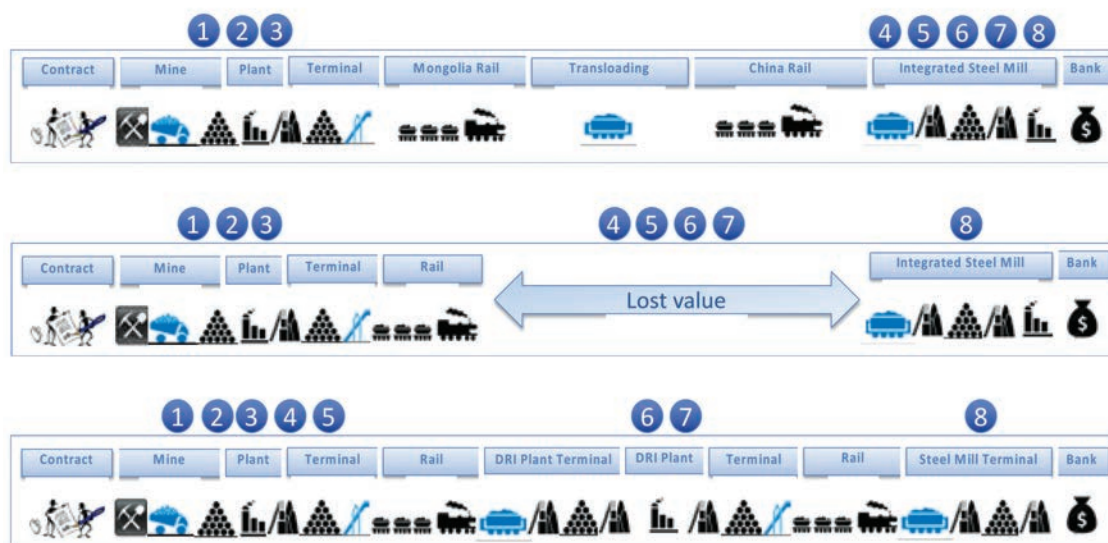
A steel value chain supposes access to sufficient iron ore for the time horizon needed to justify steel-making investments. The option of importing iron ore, most likely from China, if domestic sources were insufficient, looms large and is a major factor weighing against investment in steel. The adequacy of iron ore supply for a steel value chain in Mongolia is probably the most important factor in considering its feasibility (Figure 1.5). However, studies have drawn different conclusions on this point. There is a consensus that if more iron ore exploration

had taken place and supplies of iron ore were more certain in the long term, this factor would not be a binding constraint on going forward with a steel project.

A 2010 study reported iron ore reserves of 229 million tons distributed over 25 deposits. Less than half were being mined at that time, to produce about 6 million tpy annually.¹² Other studies suggest that at current rates of output, reserves will begin to run out within 10-15 years.¹³ Reserves are resources that have been evaluated sufficiently to have a high degree of confidence that they can be mined profitably. However, Mongolia's iron ore producers-whose operations were, for the most part, designed to meet growing demand from steel mills in China, especially when prices were high- did not invest for the long term and therefore did not invest enough to prove iron ore reserves. Some studies have speculated that iron ore reserves understate the true scale of resources that could underpin a

Figure 1.5

Schematic of full iron ore to steel mill value chain



Source - Authors, May 2020

¹² Worley Parsons, 2010.

¹³ Iron Ore: Assessing Mongolia's Potential, CRU 2012; An Economic Impact Assessment of the Iron Ore Sector in Mongolia, ERI 2014; Iron Ore Market Study, ERI 2017

steel mill. Indeed, the government refers to iron ore resources (not reserves) spread over some 63 registered deposits that amount to over 1.7 billion tons in total.¹⁴

The government commissioned prefeasibility work and then a full feasibility study of an integrated iron ore and steel project, which was carried out by Hatch between 2015 and September 2017.¹⁵ The feasibility study covered iron ore mine expansion/product upgrading at mines licensed to state-owned DMC and steel-making expansion at the existing DMC site. The return on investment for the mine expansions/upgrades to supply DMC was substantially higher (10.5 percent) than for steelmaking itself (3.8 percent). The poor returns on steelmaking are the result of the short life of guaranteed iron ore supply: DMC's iron ore mines would deplete after 13 years, so other sources would need to be found. The relatively high cost of steelmaking also reflects the small scale of the plant, the import requirement for most plant equipment (capex) and non-iron ore raw materials (opex), and high slag (waste) generation. Import competition of steel products from China created market risks, unless tariff protection was available. In 2019 the government was considering how to finance further studies to resolve the issues identified by Hatch.

There appear to be several barriers to development of the steel value chain in Mongolia. Resolution of the iron ore supply constraint could be alleviated by providing incentives for iron ore currently sold under long-term contracts to Chinese buyers to be redirected to a local steel mill or by reorganizing ownership of iron ore mines as captive suppliers. Growing the overall reserve base requires significantly more exploration than has been taking place, but the lead times for commercializing discoveries, including building infrastructure, would imply deferring the decision

on a steel project for some years. Other technical and economic issues also need to be resolved at DMC. In addition, given the limited size of the Mongolian steel product market, there is most likely no space for competing projects. If, in order to establish feasibility, public subsidies or protection are required, this option must be weighed against competing demands on scarce public financial resources.

1.4.2 Value Chains in the Livestock Sector

1.4.2.1 Meat

Increasing the productivity of the meat industry in Mongolia has been well researched. Doing so has proved a challenge, however. It is estimated that Mongolia could earn up to \$1 billion annually from meat exports given the huge demand in China alone. However, it has proved difficult to supply the quality, quantity, and consistency demanded. The meat industry faces multiple challenges, including but not limited to animal diseases and the perishing of meat in the absence of cold chain. The industry in Mongolia is still unsophisticated, driven primarily by herder households spread across the country (see Photo 1-1).

Merchants serve as intermediaries in the local supply chain between households, small slaughterhouses, and wholesalers who supply urban areas (Figure 1.6). The export market is supplied by meat-processing plants that have passed certification checks; agents source livestock from herder households. The main challenge for the sector is that the current structure cannot produce the quantity or quality required for export markets and that spoilage in the supply chain is high.

¹⁴ MRAM, 2016.

¹⁵ Hatch, 2017. (MINIS files)

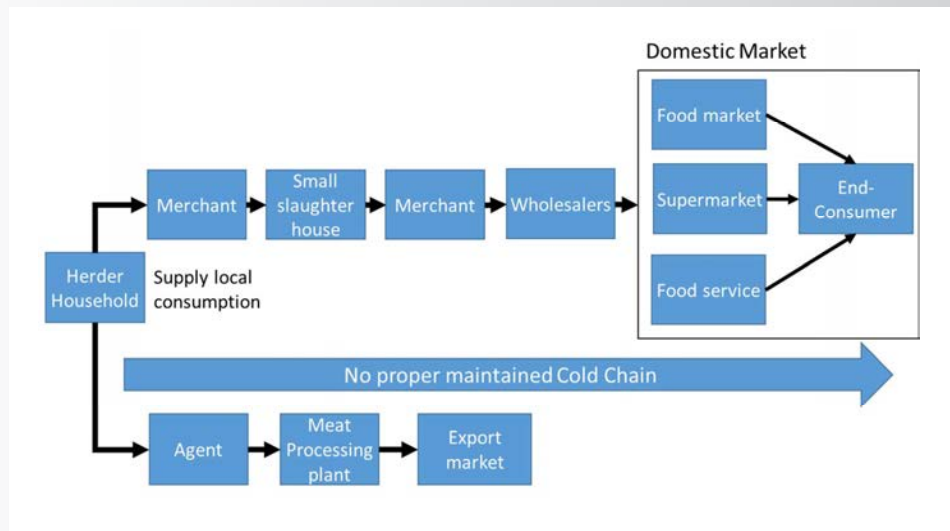
Photo 1-3.

Basic herding with rudimentary infrastructure characterizes most livestock farming.



Figure 1.6

**Current
Mongolian
meat value
chain**



Source - Authors,
May 2020

Most meat is sourced from various locations and then transported to the capital city Ulaanbaatar through a very inefficient logistics system (Figure 1.7). Considering the long distances and poor infrastructure, most of the meat value is lost along the supply chain, and export potential is not realized.

By comparison, all successful meat-exporting countries have a tightly aligned supply chain that aims to reduce loss of value at each stage from farm to ultimate market. For example, the Australian and New Zealand meat supply

chains consolidate operations using commercial farming, feedlots, and sales yards, which serve as a market mechanism through which livestock is optimally distributed (Figure 1.8). Processing abattoirs are supplied via the sales yard, with livestock that will yield sufficient conditions that are required by both the domestic as well as the export market. However, this model might be incompatible given with the social structure of herder households in Mongolia and their reliance on their livestock.

Figure 1.7

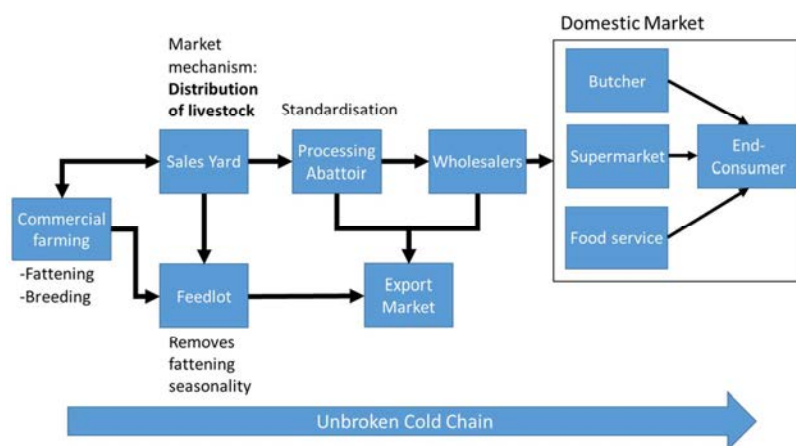
Current flow of meat in Mongolia



Source - Authors, May 2020

Figure 1.8

Benchmark international meat supply chain: Australia and New Zealand



Source - Authors, May 2020

The key to exploiting the potential in the meat value chain is to identify where value is lost along the chain and address the gaps including bottlenecks in an integrated and comprehensive manner. It is not realistic to transform the structure for herding from household to large commercial farming. However, the supply could be reorganized to reduce loss of value and increase the possibility of producing consistent quality, quantity, and reliability of supply.

1.4.2.2 Milk

The relatively large urban areas of Darkhan, Ulaanbaatar, Erdenet, and Zuunkharaa are supplied with milk by herder households who live within a radius of 50–100 kilometers. The supply chain involves a middleman or farmers delivering milk in 1- to 2-ton trucks. The milk is then taken to either a milk cooling center or a milk-processing plant. Milk-processing plants supply bakeries and restaurants, schools (through the government lunch program), and retail stores. A small portion of the milk is delivered directly to canteens, kindergartens, hospitals, sanatoriums, and kiosks. The transportation of milk in other *Aimags* often involve horse or motorbike and the milk is distributed in a similar fashion to that of the urban centers.

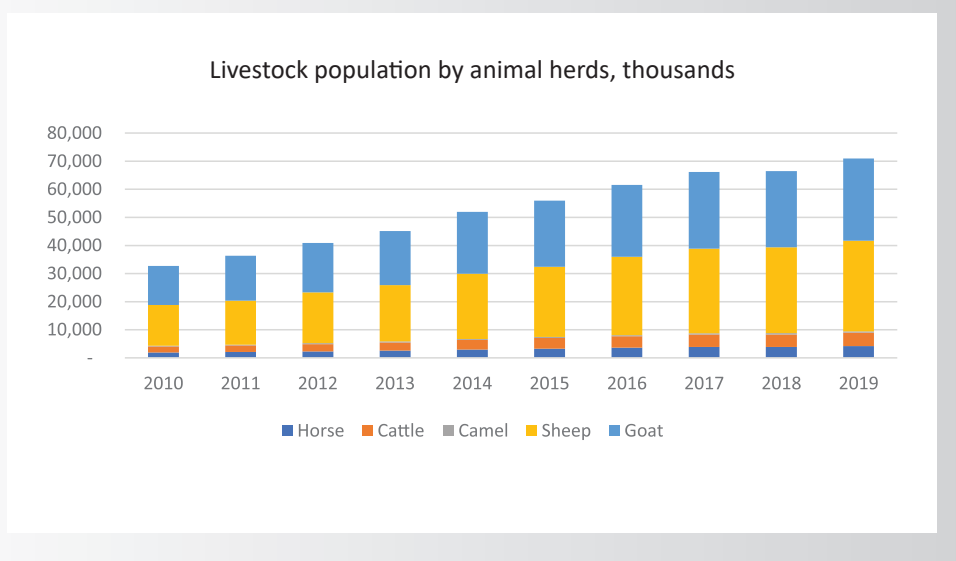
Like the meat and animal by-product supply chains, the milk supply chain is inefficient. Mongolia is a net importer of milk and milk products, driven by demand in urban areas. Rural households consume up to four times as much milk as households in and around urban centers, because of a combination of a lack of technical expertise, modern dairy technologies, and equipment. Milk producers operate in a space with lack of services with regard to animal health, breeding, and feeding. Lack of cold chain leads to post-harvest losses of about a third of the milk. Opportunities to address shortfalls should first address domestic demand.

1.4.2.3 Cashmere

There is significant untapped potential for expanding wool and cashmere exports. Given its unique natural environment, Mongolia is well suited to sustaining large herds of sheep and cashmere goats and producing high-quality wool and cashmere for the global markets. The country has a large pool of livestock that is steadily growing, despite intermittent losses caused by severe winters. As of 2019, over 70 million livestock (mostly sheep and goats) grazed across the pastureland of Mongolia (Figure 1.9).

Figure 1.9

Livestock population in Mongolia, by animal herd, 2010–19



Source: (NSO, 2020)

With almost 30 million goats that produce one of the finest-quality cashmere, the country is the second-largest producer of cashmere in the world, with a global market share of almost 40 percent.

The cashmere-wool sector plays an eminent role in diversifying Mongolia's economy and the products offer the highest value density compared to the other agricultural outputs. Producers in the cashmere-wool industry tend to be organized in terms of their supply of inputs, value-added production, and distribution channels. They generally have control over their inbound and outbound supply chains and are increasing their control over the production and supply of inputs. The major challenge for farmers is to expand their distribution channels while continuing to increase the value of their products (World Bank 2019).

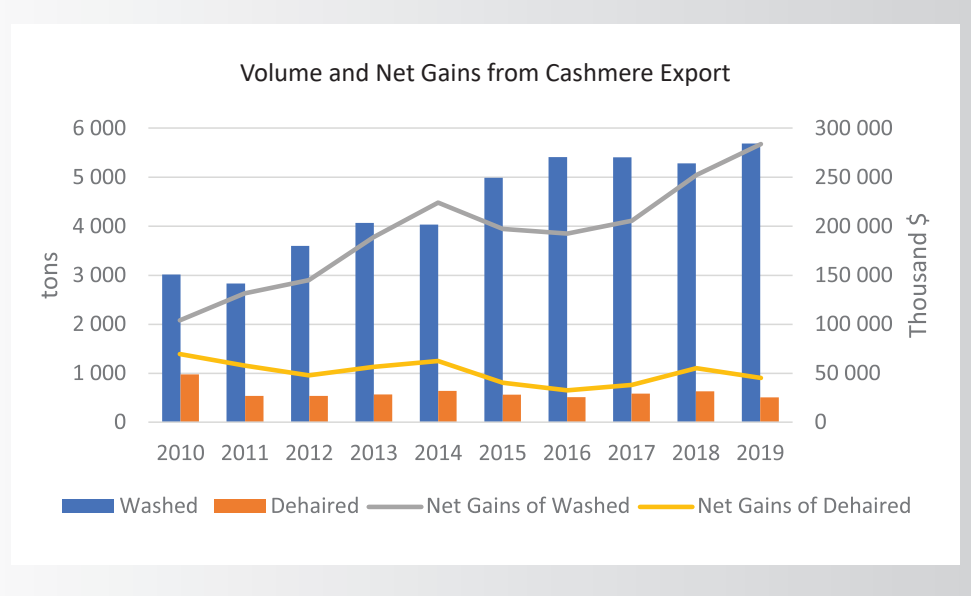
Mongolia's cashmere-wool industry has underperformed relative to the country's comparative advantage. According to the Ministry of Food, Agriculture, and Light Industry, Mongolia had the capacity to produce about 9,500 tons of cashmere and 33,600 tons of wool as of 2019. Although the export of raw cashmere is banned, the majority of the cashmere is exported with little value-add upon washing.

In 2019, Mongolia exported over 6,100 tons of washed cashmere (Figure 1.10). Domestic capacity is about 13,000 tons for washing, 6,220 tons for dehairing, 4,350 tons for combing, 1,680 tons for spinning, and 2.8 million pieces for knitting. Utilization is very low, however, ranging from as low as 33 percent for combing to as high as 82 percent for washing. The country was able to use only 65 percent of its capacity to produce woven products in 2018. Although the potential of the sector remains unrealized, the cashmere garment industry matured significantly over the last decade, through investments in equipment for dehairing, spinning, and weaving. Mongolia has 38 processing plants and almost 200 small-scale cashmere-processing facilities. Producers have strengthened their design and marketing capabilities and established their brands, achieving some diversification of both products and markets. As a result, the largest companies in the industry, such as Gobi, have expanded their sales. The country exports cashmere and cashmere products to over 20 countries, including China, France, Germany, Italy, Japan, the United Kingdom, and the United States. Over the last decade, export prices of greasy cashmere fluctuated by about \$65 per kilogram, after reaching a peak of almost \$110 per kilogram in 2011. In 2019, the export price of greasy

Figure 1.10

Volume and net gains from Mongolia's cashmere exports, 2010-19

Source: Mongolian Customs.



cashmere was about \$90 per kilogram, and Mongolia generated \$328 million from exports of washed and dehaired cashmere.

Most companies in Mongolia do not produce final products. Over 82 percent of the companies involved in processing cashmere continues to produce intermediate rather than final products. Most intermediate products are exported, although an increasing proportion is supplied to domestic garment manufacturers. Such a pattern of sales reduces value addition, which is greatest at the end of the value chain, at the point of sale to the final client.

All large processing plants are in Ulaanbaatar and Erdenet. Although some washing centers are in rural areas, they tend to be smaller and less efficient entities. As the yield of dehaired cashmere from raw cashmere is 50 percent, processing in the rural areas offers significant savings in transport costs that would otherwise involve journeys of up to 1,000 kilometers over poorly paved roads. The low density of raw cashmere production reduces the size and utilization of these processing facilities, offsetting the savings in transport costs.

In addition to infrastructure, multiple constraints impede Mongolia's progress toward producing higher-value exports of cashmere-wool at greater scale. The first constraint is the availability of grazing land, exacerbated by subsidies from the government, which creates incentives for quantity over quality. In some cases, herders have diluted pure-bred Mongolian livestock with inferior foreign breeds to maximize their annual output, creating downward pressure on local market prices.

1.4.2.4 Leather and leather by-products

Mongolia exports mostly intermediate commodities rather than finished leather goods. The nomadic style of animal husbandry practiced in Mongolia limits the year-round availability of inputs and places an upper bound on the economic viability of more sophisticated manufacturing. A few processors deliver finished goods to local consumer markets in Mongolia. However, the

quality and reliability of the leather supply chain must be improved if Mongolia is to export to large international markets. Exports require laboratory examination and certification on both sides of the border. Discrepancies between the findings of the Mongolian and Chinese laboratories often cause shipment delays. During outbreaks of bovine diseases such as foot-and-mouth disease, the Chinese and Russian authorities banned or restricted trade with Mongolia altogether. This had a negative impact on the leather industry.

Mongolia's leather industry constitutes a small fraction of global trade. The total export value of bovine leather was just over \$8.4 million (WITS 2018) and reached over \$11 million inclusive of hides in 2019. The main trading partners are China and Italy. Mongolian exports are used as inputs into processed leather products that are exported to destinations such as Ethiopia, Italy, and Vietnam. However, Mongolia has not achieved a major market share of leather for any of these importing countries. The Chinese market seems to offer immediate opportunities for export growth. Mongolian leather is typically derived from goats, cows, and sheep. The skins are purchased on a seasonal basis and typically freighted by truck to China's Tianjin Port and then by ship to their destination. The price is calculated per square meter of skin; it ranges from \$0.05 to \$0.12 per meter, depending on the type of leather. There is increasing cooperation between herders, cooperatives, and processing factories that could be fostered through a shared interest in quality improvements that could lead to higher prices. Incentives (such as improved pasture management and collective action institutions) for herders who sell skin and hides are available only to members of the cooperatives, which has strengthened the role of cooperatives in the value chain. Mongolia has 34 leather-processing factories. Sixteen of them carry out final processing, of which 2 produce final leather products (the remainder engage in semi-final processing). All but two are in Ulaanbaatar. There is also a larger constellation of smaller processors and family businesses. Most factories process only up to the wet blue stage. About 20 percent

produce processed leather, but this percentage is decreasing, as a result of quality issues linked to resilience, odor, and skin damage.

Mongolian leather producers are more concerned about consolidating the supply chain than about opening new export markets.

Upstream integration can offer leather producers the opportunity to agglomerate supply, reduce wastage, and add value to the items produced in Mongolia. The leather industry can create export opportunities by applying international standards to the processing, storage, and supply of raw produce. Once international quality standards are met, Mongolia can enhance its brand presence, building a foundation for export sales.

To be competitive, Mongolia's leather industry needs a fundamental upgrade.

Although the potential for value of leather exports is more limited than that for meat and cashmere, Mongolia's access to the Chinese market represents an attractive opportunity. The low quality of products, lack of local storage, poor access to finance, and undeveloped distribution channels stymie efforts of entrepreneurs to turn the leather market around.

1.4.3 Tourism

Mongolia has a rich cultural heritage and breathtaking landscapes that attract 500,000 visitors a year, contributing revenue of over \$590 million to the state budget as of 2018. By capitalizing

on the country's unique natural landscapes and rich cultural heritage the tourism sector could become one of the pillars of the economic diversification agenda in Mongolia. Several previous reports have highlighted this potential, but it remains untapped. Mongolia has adopted a three-phased approach to become an international destination for nomadic culture and tourism, as outlined in its Sustainable Development Vision 2030. This strategy identified basic infrastructure and services as requirements to develop eco-tourism regions, with a plan to attract 1 million tourists by 2020 and 2 million in 2030.

One of the major challenges for the tourism sector is that Mongolia has a relatively short tourism season, between May and September.

The Ministry of Environment and Tourism estimates that the domestic tourism industry has the capacity to receive up to 1.2 million visitors during this period of the year, or 72,000 a day. As shown in Figure 1.11, especially after 2015, the number of tourists rose sharply.

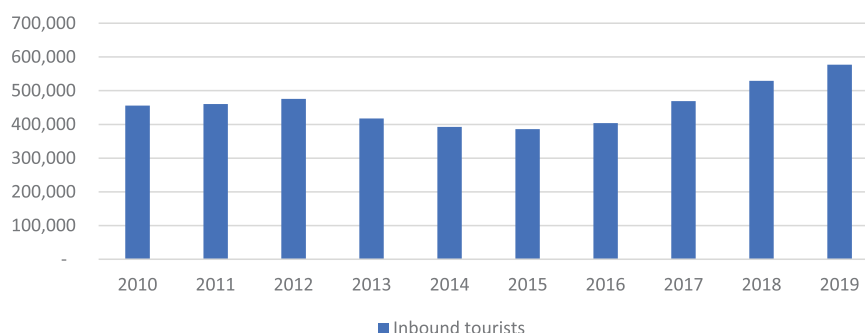
In the short to medium term, the COVID-19 pandemic and associated travel restrictions will reduce the inflow of tourists.

As of April 2020, 96 percent of global destinations had imposed travel restrictions in response to the pandemic causing unprecedented disruption in the tourism industry globally for an uncertain period (UNWTO, 2020). Mongolia closed its air and land borders progressively beginning January 31, 2020. But

Figure 1.11

Number of inbound tourists in Mongolia, 2010-19

Source:
NSO, 1212.mn.



even in the absence of COVID-19, the underlying trend of inbound tourism still fell short of target, with international tourist arrivals peaking at 577,000 in 2019, half the targeted number.

To unlock the full potential of tourism, Mongolia needs to have the transport infrastructure and system in place. At a minimum, this must include infrastructure connecting the new Ulaanbaatar international airport in the Khushig Valley to the capital. The core connectivity infrastructure to the airport include a six-lane 30.4-kilometer-long highway and the airport rail express which are at various stages of implementation. Ultimately, good transport connectivity should link international tourists to hotels and various sites.

Mongolia has targeted adventure and heritage tourists, however, it has not positioned itself for business tourists (Photo 1 4). Every year, several International companies and delegates visit for business purposes and also for conferences. Therefore, if well positioned business tourism has potential to create economic opportunities. Even prior to the Covid 19 pandemic it was been challenging for most hotels to break even, as the

occupancy rate of hotels remained a little over 50 percent. Business tourism has a positive impact on income, jobs, and taxes, as business tourists spend money on event registration, travel, accommodation, food and beverage, leisure, and shopping. Over time, it also has a positive impact on foreign exchange, international awareness of local expertise, international profiling of the host country, education of local industry executives, and the quality of infrastructure of the travel industry. Nonetheless, were it has been successful, the host has had to put in place comprehensive facilities and investments specifically targeted at promoting business tourism. This has to be a deliberate and coordinated effort between public and private sector.

Overall, the aim of a focused tourism sector is to maximize opportunities to attract FDI and spending across the economy. In the case of Mongolia, the full spectrum of tourism has not yet been tapped, and the pandemic and the associated travel restrictions mean that it may be a while before the sector recovers.



Photo 1-4.
*Adventure
tourism has
grown rapidly.*

1.4.4 Digital Development and the Service Sector

Mongolia has potential to create a vibrant knowledge-based digital economy. It was recognized as highly efficient in translating innovation inputs into outputs and ranked 30th on the Innovation Efficiency Ratio of the *World Intellectual Property Organization's* Global Innovation Index (WIPO 2018). The rank was driven largely by its high performance on the creation of knowledge and intangible assets. In terms of growth of innovative companies, Mongolia ranks above average on the Global Competitiveness Index but below average in terms of its cluster development, despite the sectoral development policy framework.

Mongolia's Digital Readiness Assessment revealed that Mongolia has adequate infrastructure in place but several unmet requirements for digital readiness to harness technological advancements (Figure 1.10). They include but are not limited to the technology adoption rate, accessibility and affordability of

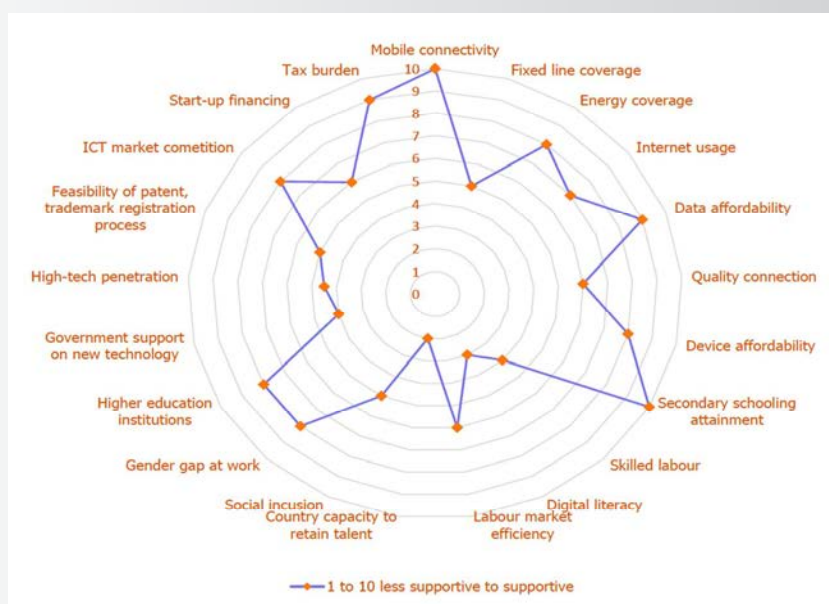
the internet, and the availability of financing and talents for digital technology start-ups and digital literacy among the public. These findings reveal that implementation of the government policy on information and technology development falls short of fostering knowledge-based industries. The National Digital Strategy Primer for Mongolia outlined the following strategies to close the gap in digital readiness:

- digital education for all at all phases of life
- better connectivity and accessibility of the internet
- effective regulation to create a friendly business environment
- creation of a friendly ecosystem for innovative start-ups
- a well-developed cybersecurity and data protection system
- sectoral policies that embed technology to accelerate socioeconomic development (Pathways for Prosperity Commission on Technology and Inclusive Development, 2019).

Figure 1.12

Mongolia's digital readiness assessment

Source: Pathways for Prosperity Commission on Technology and Inclusive Development 2019.



Mongolia's telecommunications market is relatively competitive and liberalized. However, it needs to ensure stable, reliable, fast, and affordable internet connectivity, because the internet is the main infrastructure foundation for the digital economy. Though, both mobile-cellular subscription rates and smartphone penetration rates are much higher than average middle-income countries, Mongolia still ranks 90th out of 141 countries surveyed in terms of broadband speeds through mobile phones,¹⁶ and the population does not appear to be well-positioned to leverage the full potential of a digital economy. Less than 24 percent of the population was using the internet in 2018, a much lower figure than the average for lower middle-income countries (about 35 percent) and countries in East Asia and Pacific (about 51 percent excluding high-income countries).¹⁷

Given Mongolia's young population and relatively well-established digital connectivity, digital entrepreneurship has the potential to become an engine of economic transformation in Mongolia and set the country on a new growth trajectory. The power of digital technologies lies not only in the strength of broadband capacity or the distribution of digital devices but also in the development of digital platforms. While many platforms in Mongolia have begun to offer common digital services, such as e-commerce and e-wallet, entrepreneurs with earlier success record of launching technology-based ventures have started grooming the next

generation entrepreneurs to compete regionally through a collaborative platform driven by a global community of investors, startups and professionals (Box 1.2). It is critical to support such an initiative to build Mongolia's competitive advantage in the regional, if not global, innovation and technology development space. As for the platforms that provide third-party services, they enable both companies and customers to leverage economies of scale and network effects to generate efficiency gains. In the short run, the industry could benefit from various forms of support by the government, however, as they mature, the government could also consider defining the marketplace and gradual taxation for digital assets to ensure fair competition and reap the benefits of fostering the digital businesses.

The Mongolian economy stands to benefit from the growth in supply and usage of digital financial services. In Mongolia, 93 percent of the adult population holds bank account, but only 22 percent of a bank account holders use digital financial services. In emerging economies, digital financial services providers are better positioned to address the needs of the marginalized people. They also create the "rails" that enable digital entrepreneurs from other sectors to market their products at scale. Better digital financial services can also strengthen links with the Mongolian diaspora, boosting remittance streams, encouraging investments, and facilitating the exchange of human capital.

Box 1.2 Irbis Ventures: Helping Mongolian startups to expand beyond borders

Irbis Ventures was founded by a group of Mongolian entrepreneurs who've setup the first and the largest fintech company in Mongolia. Incorporated in Singapore, Irbis Ventures has created a virtual platform driven by promising Mongolian technology startups, global community of investors and professionals to bridge scalable technology-based business solutions from emerging markets with available resources in mature ecosystems while expanding their business presence overseas. Through Irbis Ventures, several Mongolian upcoming start-ups, including Erxes and iHotel, have raised early-stage funding from international investors and received mentorship for international expansion at low cost.

Source: Irbis Ventures Pte. Ltd. n.d.

¹⁶ Speed Test Global Index. <https://www.speedtest.net/global-index>

¹⁷ International Telecommunication Union (2018). "Individuals using the Internet (percent of population). (IT.NET.USER.ZS)." Retrieved from World Development Indicators.



Photo 1-5.
Young and
educated
population is
backbone for
the service
sector.

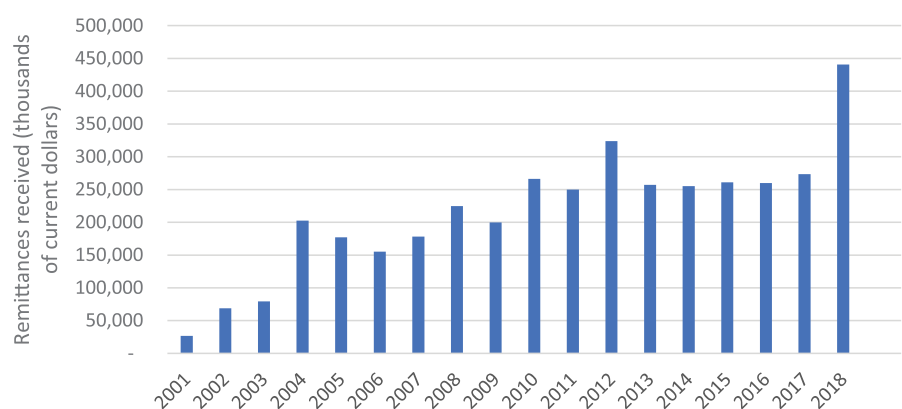
Another area of growth in retail banking is digital payments, in particular remittances from abroad. The Mongolian diaspora has been playing a part in stimulating the economy; digital financial services at home can make it easier for them to do so. At least 200,000

Mongolians live abroad. In 2018, they remitted almost \$450 million (Figure 1.13), a little more than 3 percent of Mongolia's GDP. The opportunity to receive a small remittance in real time or obtain an affordable loan could have a significant impact on marginalized people's

Figure 1.13

Remittances
received in
Mongolia,
2001–18

Source: World Bank
2018.



livelihoods. Digital financial services products for businesses-particularly small and medium-size enterprise (SMEs) - remain an untapped niche. Mongolia ranked 81th on the Ease of Doing Business Index 2019 in terms of access to credit. Although banks offer financial services for relatively well-established companies with assets qualified for collateral, Mongolian markets lack affordable SME lending, investment, or payment products. Technology start-ups also lack access to early-stage funding. There are opportunities to offer innovative financial products that meet the requirements of SMEs in Mongolia.

Blockchain technology presents opportunities for the public and private sectors in Mongolia. Several Mongolian companies are beginning to partner with international companies to offer distributed-ledger platform and related products and services, a hybrid financing instrument (asset-backed cryptocurrency) to develop blockchain-based utilities management platform.

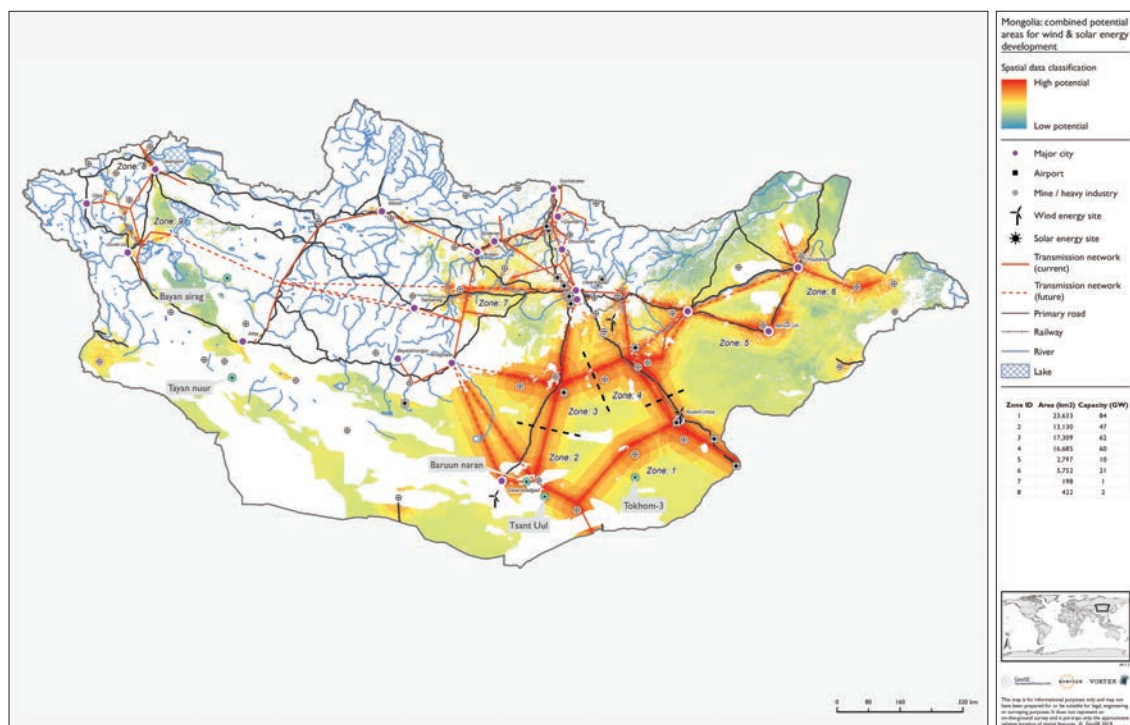
In the public sector, as part of the government's move to embrace emerging technologies, a partnership with a global blockchain payment system provider was established in 2019 to test peer-to-peer payment system to enable hassle-free local transfers and overseas remittances.

1.4.5 Renewable Energy for Export

Despite its reliance on fossil fuels, Mongolia has a substantial renewable energy potential, which holds the promise to be a major domestic resource for a transition to a low-carbon development path as well as a significant export opportunity. Exploitable solar resources are estimated at 700 GW, mainly in the east and south of the country. Exploitable wind resources are estimated at 400 GW, mainly in the south and southeast. Exploitable hydropower resources are estimated at 7 GW, mainly in the north and northwest. (See Figure 1.14)

Figure 1.14

Exploitable wind and solar resources in Mongolia, assuming completion of planned power transmission construction in the southeast



Source: Vortex/Everoze 2020.

Tapping the country's rich renewable energy potential is in line with the priorities identified in the 2015 State Policy Paper on the Energy Sector, including (a) enhancing energy security, (b) improving the efficiency of the sector and creating favorable conditions for a market-based environment, (c) introducing modern and clean technologies, and (d) building the export capacity of the sector. Although developing export opportunities may take time, in the longer run (after 2030), power could be a major export product and growth driver for Mongolia, as recognized in the government's draft Vision 2050 policy document. Mongolia's peak load is only about 1 GW. Taking capacity factors into account, Mongolia could generate about 300 times more than its current total power consumption from renewable energy sources. Not only does this potential present options for clean and sustainable domestic supply, renewable energy also constitutes an important opportunity for exports, possibly in the context of the initiative to interconnect the power systems of China, Mongolia, Russia, the Republic of Korea, and Japan, known as the North Asia Power Sector Interconnection (NAPSI or Asian Super Grid), launched by Japanese Softbank.

Scenarios being considered include a phased approach with 5 GW export from Mongolia around 2030, which could be increased to as much as 100 GW in 2040. Each GW of installed capacity would lead to annual exports of roughly 2.5–3 billion kWh. Mongolia imports electricity at a cost of about \$0.10/kWh. Export prices would likely be lower, at about half that value. Consequently, renewable energy exports could represent very substantial monetary flows, on the order of tens or even hundreds of billions of dollars a year, and contribute to Mongolia's economic diversification by creating new export revenue streams that are unrelated to mining. Such a development would contribute significantly to reducing greenhouse gas emissions and air pollution in the entire region.

As a first step toward power trade with China, Mongolia should discuss linking the Mongolia Central Energy System to the Chinese grid through by establishing a back-to-back (B2B) converter station that will allow power exchange between the two countries despite the fact that their power systems run on different synchronization. The government should also reevaluate its commitment to establish new coal-fired capacity at the Baganuur and Tavan Tolgoi coal mines in the light of the option of establishing large solar and wind power plants for supply of indigenous power to the big mining operations in South Gobi, which can be established more rapidly and with less risk of turning into stranded assets.

1.5 Toward Selectivity: Regional Connectivity and Potential Linkages

As a landlocked country between China and Russia, Mongolia depends on connectivity to its neighbors. China is Mongolia's largest foreign investor and trading partner, with more than 90 percent of Mongolian exports going to China (primarily copper, coal, and gold). Mongolia also strives to advance its bilateral economic and trade relations with Russia. In 2014, the three countries formalized their intentions to forge closer economic ties and develop infrastructure and industrial projects through the CMREC.

A variety of areas for economic cooperation have been identified. Several hurdles will need to be overcome if the overarching goals are to be realized. They include poor transport infrastructure, complications at border-crossing points, cumbersome trade facilitation and inspection procedures, and lack of interoperability of railway systems. To address these bottlenecks, the program of cooperation includes 32 projects to improve connectivity between the three countries by rail, road, energy transmission lines, gas and oil pipelines, and high-speed internet connections. It was envisaged that these projects would be financed by a combination of contributions from the national governments, private sector investment and PPPs, and national and multilateral financial institutions.

The key challenge in realizing these connectivity investments lies in the fact that the CRMEC is not the only transit route between China and Russia and Mongolia's demand for transport services alone is insufficient to justify substantially upgrading existing routes through its territory. Indeed, using a combination of gravity and general equilibrium modelling, the World Bank (2019) estimated the economic rates of return of a variety of interregional transport corridors under the China-sponsored Belt and Road Initiative. The results for Mongolia show that the benefits accruing to Mongolia from the necessary investments in rail and road infrastructure are insufficient to justify their costs. The infrastructure should thus be built only if Chinese and/or Russia users are willing to assume the bulk of the cost.

The Ministry of Foreign Affairs was selected as the main implementing body of the projects related to CRMEC. Within the ministry, an *Investment Research Center* was created. It is responsible for conducting research on technology; economic development; harmonization of regulations of the three countries necessary for the successful implementation of the projects; and the environmental impact of the projects related to infrastructure, border checkpoints, free trade zones, and urban development, in accordance to international standards and related domestic laws and regulations. It was envisaged that the Investment Research Center would serve the national interests of Mongolia and act as a Joint Center for Investment Planning and Projection and a Secretariat in which China and Russia would also participate.

In March 2017, a trilateral expert meeting was held in Beijing with representatives from the Ministry of Foreign Affairs of Mongolia, the National Development and Reform Commission of China, and the Ministry of Economic Development of Russia. The parties discussed the priority projects and their criteria and agreed to establish a “trilateral cooperative mechanism” for ensuring implementation of the agreed program with the priority projects. A Second Trilateral Expert Meeting took place in Moscow August 29, 2017. The parties agreed on the content of the “trilateral cooperative mechanism” for ensuring implementation of the projects listed in the Memorandum of Understanding on the Economic Corridor. They also agreed to implement three priority projects: the Central Railway Corridor, the Central Highway Corridor, and upgrading of the electricity transmission line. Although most joint projects are related to transport infrastructure, the Ministry of Foreign Affairs is responsible for them. To date most of these project have remained at feasibility stage and it is not clear where the funding will come from.

In sum, the potential benefits of the CRMEC have not yet accrued to Mongolia, largely because China and Russia would need to finance the bulk of the required investments, as the benefit-cost ratio from Mongolia’s perspective alone is not high. Mongolia could undertake some actions at home that would significantly increase its expected benefits should the infrastructure be built, thereby making the investments more attractive to China and Russia. Such actions include improving its trade facilitation system, investing in transshipment and logistics infrastructure, and improving the investment climate, thereby generating greater demand for transport from within Mongolia. These actions would complement the ongoing political process led by the Ministry of Foreign Affairs. (Chapter 4 analyzes the specific investment opportunities in this regard.)

Infrastructure as a Constraint to Economic Diversification and Competitiveness

- 2.1 The Challenges of Distance and Density
- 2.2 Transport Infrastructure: Quality, Capacity, and Coverage
- 2.3 Energy Infrastructure: Quality, Capacity, and Coverage
- 2.4 Digital Infrastructure: Quality, Capacity, and Coverage



2

INFRASTRUCTURE AS A CONSTRAINT TO ECONOMIC DIVERSIFICATION AND COMPETITIVENESS

2.1 The Challenges of Distance and Density

Mongolia faces significant geospatial challenges in accessing regional markets that it needs to overcome if it wishes to diversify its economy. Of its 3.2 million people, 1.4 million live in and around the capital, Ulaanbaatar. Other large urban areas are Bayan-Undur (population 98,000) and Darkhan (population 83,000). The rest of the population lives in herder households in the countryside, at a density of 120 people per 100 square kilometers. The country is physically connected mostly through a network of 15,000 kilometers of national roads of various conditions, ranging from earth tracks to asphalt concrete. Mongolia has only 1 kilometer of road for every 100 square kilometers of land, evidence that the country's production factors are not sufficiently interconnected. Mongolia's landlocked nature is an additional barrier to participating in global trade.

Experience from resource-rich economies across Eurasia, Latin America, and Africa reveal that diversification strategies that have worked best are those that lead to a more balanced set of economic assets (World Bank 2014). Given the damaging consequences of overreliance on mining to prop the economy, the big challenge for Mongolia is how to diversify the drivers of growth by taking advantage of all its natural and human resources. Several high-level policy documents have identified potential for economic diversification in mining beneficiation and processing, the livestock sector, business tourism, services, and renewable energy for export. In the livestock sector, some estimates suggest that exports to China could be as much as \$1.0 billion annually. The challenge has been how to unlock this potential. Each of these sectors requires transport, energy, and digital infrastructure. However, with average transport distances of more than 600 kilometers, logistics costs are about 30 percentage of GDP and some of the lowest contributions from the infrastructure sector to GDP, Mongolia needs a different approach to developing much needed infrastructure. A "build and they shall come" approach for each infrastructure sector is suboptimal.

2.2 Transport Infrastructure: Quality, Capacity, and Coverage

Mongolia has poor connectivity, because of a combination of infrastructure gaps and inefficient cross-border processes that contribute to delays in the movement of goods. Different government entities in charge of cross-border processes require the same data, but freight forwarders need to submit to every government agency. Delays are exacerbated by gaps in the physical infrastructure, which reduce the competitiveness of Mongolia.

Poor storage facilities and inefficient distribution mechanisms are major hindrances for the distribution, transport, and storage of domestically produced goods in Mongolia. This inefficient logistics system leads to high-priced goods and creates congestion and pollution in cities, especially Ulaanbaatar. Mongolia could act as a land bridge between China and Russia. From its strategic position, it has potential to provide easy passage of goods between the two countries. However, relatively small volumes transit through Mongolia, because of poor rail and road infrastructure.

2.2.1 Road Network

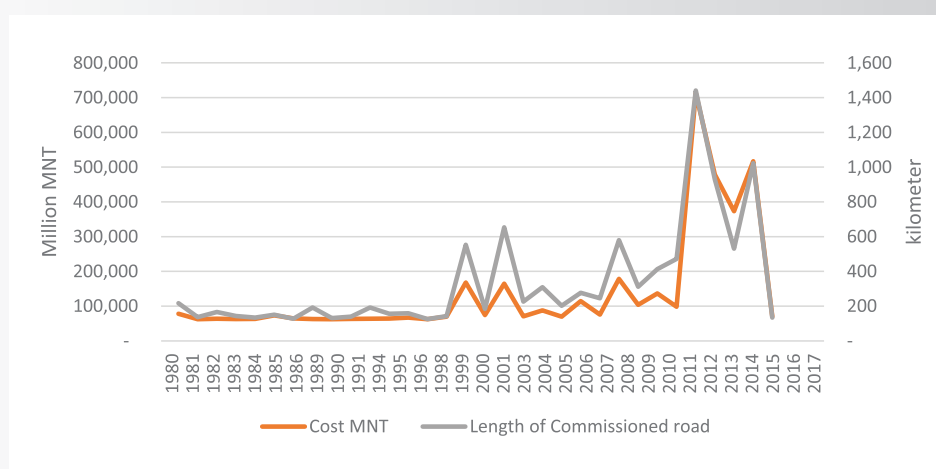
Investments in the road network have increased significantly since 2000, according to road inventory records from the Ministry of Road and Transport Development. Approximately, 70 percent of the roads were commissioned between 2013 and 2016. There has been a substantial increase in road infrastructure investment since the 2000s (Figure 2.1). The increase is partly attributed to the Millennium Road Project connecting east and west Mongolia. The period 2000-10 saw the commissioning of 1,975 kilometers of paved roads. The longest were the A0301 from Ulaanbaatar to the West, the A0501, the A0502, and the A0503 to the east of the capital. During this period, the A0401 and A0101, which connect Darkhan with Govisumber, were also commissioned. These infrastructure developments were funded by a combination international investors that included the Asian Development Bank (ADB 2011) and the Japan International Cooperation Agreement (Ernst & Young Sustainability Co., Ltd., 2012), along with government funding. The period 2011-16 saw an additional 4,296 kilometers of paved road

Photo 2-1. *Lack of all year-round access is a constraint in several parts on Mongolia.*



Figure 2.1

Length and cost of road infrastructure commissioned in Mongolia, 1980–2017



commissioned connecting the *Aimag* centers to Ulaanbaatar. In 2012 the 240-kilometer road connecting the Tavan Tolgoi Coal mine to the Chinese border was jointly funded by the Development Bank of Mongolia (UNESCAP, 2019).

Mongolia has an inventory of 15,172 kilometers of roads, ranging from earth to asphalt, and 15.33 kilometers of bridges, made from steel, concrete, and wooden. The roads from Ulaanbaatar to the *Aimag* centers and economically active border

posts are mostly asphalt concrete and in good condition. There is a total of 6,630 kilometers of paved road surface in Mongolia, 77 percent of which are in good condition. Figure 2.2 gives a summary of the national road surface and conditions in Mongolia. Of the nonpaved national roads, 924 kilometers are gravel roads, of which 69 percent are in a moderate to good condition. Some 1,254 kilometers of national road sections (8.2 percent) are not paved (Table 2.1).

Figure 2.2

Road surface inventory of Mongolia

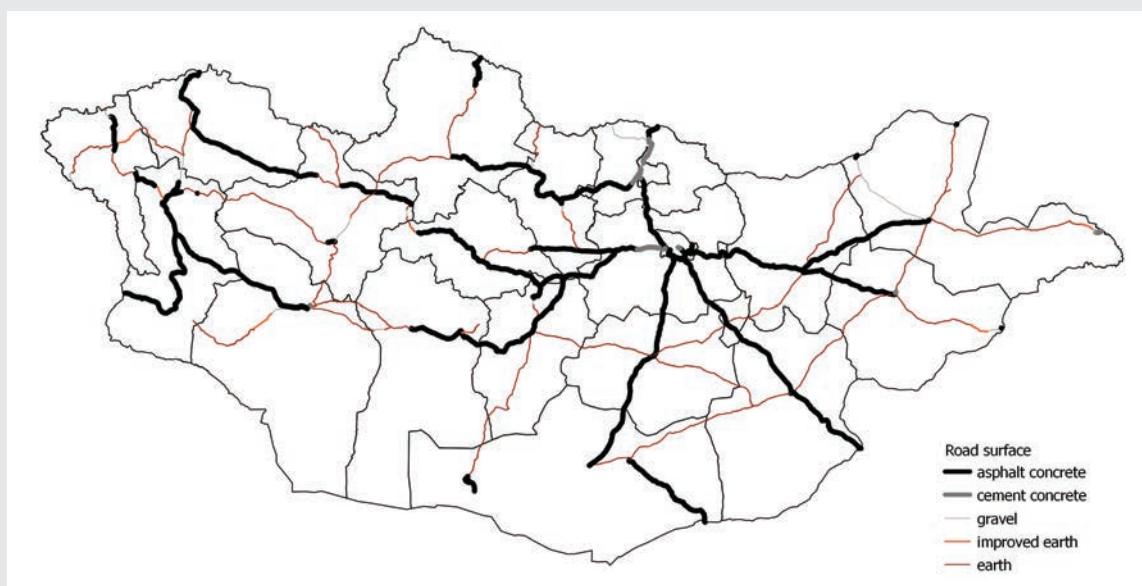


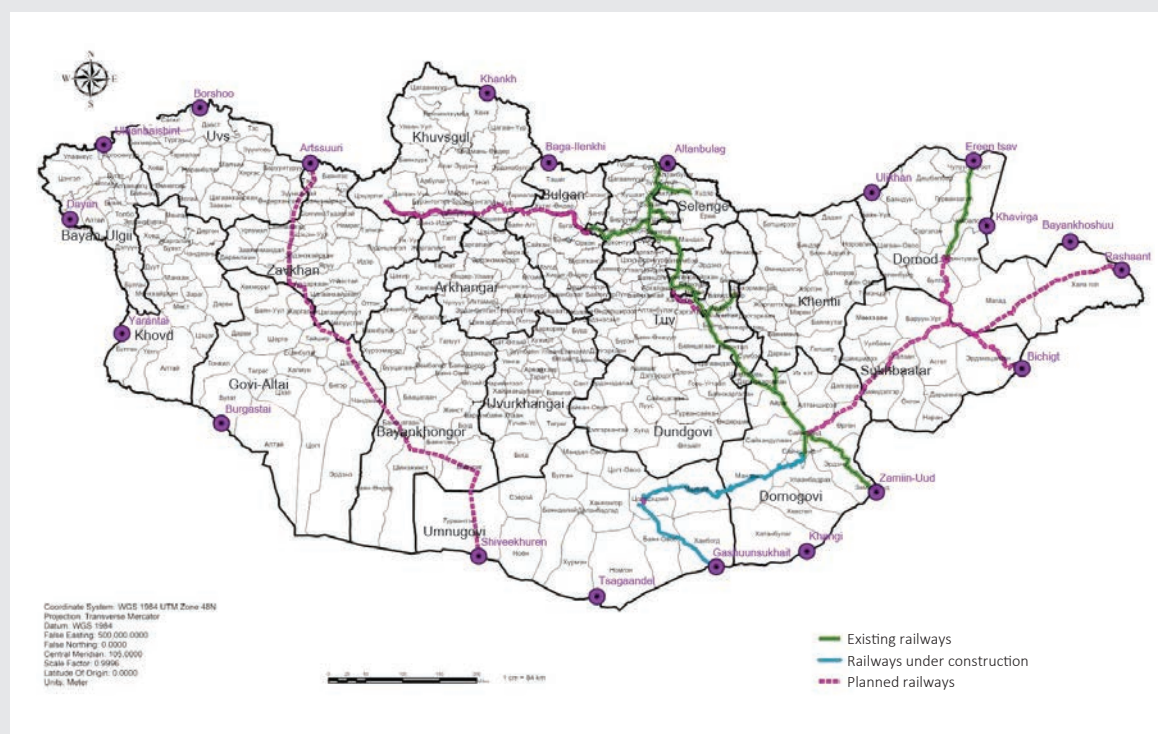
Table 2.1 Quality of Mongolia's roads, by type of road surface (kilometers) 2018

Type of road surface	Assessment					Total
	Very Good	Good	Moderate	Poor	Bad	
Paved	406	4,697	1,069	430	28	6,630
Gravel	0	450	183	274	17	924
improved earth	0	159	45	110	16	330
Earth	0	0	0	0	0	7,288

2.2.2 Rail Network in Mongolia

The Mongolian rail network comprises **1,815 kilometers of broad-gauge track**. It includes 1,110 kilometers on the main line linking Russia to China and 238 kilometers on a separate network in Eastern Mongolia that has its own link to the Russian railway; the remaining 477 kilometers are branches from the main line (going to mines) (Figure 2.3). Thermal coal is transported via rail to power plants in Ulaanbaatar, Darkhan, and Erdenet. Copper concentrate produced by

Erdenet is destined for either China or Russia. Since about 2009, iron ore produced near railheads on the Trans-Mongolian Railway has been exported to China. Most of the growth in coking coal exports has relied on roads. As a result, domestic rail transport still took up the largest share of the 20 million railed tons in 2016. Of the freight that was exported, 97.4 percent went south to China and only 2.58 percent north to Russia in 2016.

Figure 2.3 Railway network in Mongolia

Source: Ulaanbaatar Railway Company (UBTZ)

Data obtained from the Ulaanbaatar Railway Statistic office show that 70 percent of imported goods are from Russia and 30 percent are from China in 2018. Eighty four percent of transit cargo was transported from Russia to China and 15.9 percent of transit cargo was transported from China to Russia. Although there has been sufficient demand for cargo operation, rail volumes are limited by throughput capacity of the railway infrastructure and operation, which depends on the number of freight wagons and locomotives, the working condition of the terminal for loading and unloading cargo, the number of stations, the rail track length of the rail station and other factors.

There are two major challenges for the transit movement of goods by rail between Russia and the China through Mongolia: the difference in the railway gauge between Mongolia and China and the paucity of locomotives and wagons in Mongolia to operate trains carrying transit cargo. In addition, much of Mongolia's fleet of locomotives and wagons is expected to be out of

service soon, as most locomotives are approaching the end of their economic life. In addition, the Tianjin–Ulaanbaatar railway connection is subject to fluctuating transport times caused by the unpredictability of transloading at Tianjin Port. Mongolia-bound containers have neither a green line nor dedicated storage and handling facility, and seaports in China do not provide direct access to ship berths. Cargoes for Mongolia are therefore vulnerable to congestion at the port. Multiple freight terminals are served by the Ulaanbaatar Tumor Zam railway station, which creates an inefficient system leading to redundancy of assets, higher handling costs, and longer turnaround times. Significant delays lead to higher total costs for consumers. A large proportion of the time and cost related to transport of containers is caused by issues outside Mongolia, such as long detention times at external ports. Only three border crossing points have rail connectivity, and road connectivity at the remaining border crossing points is inadequate. Infrastructure is inadequate at

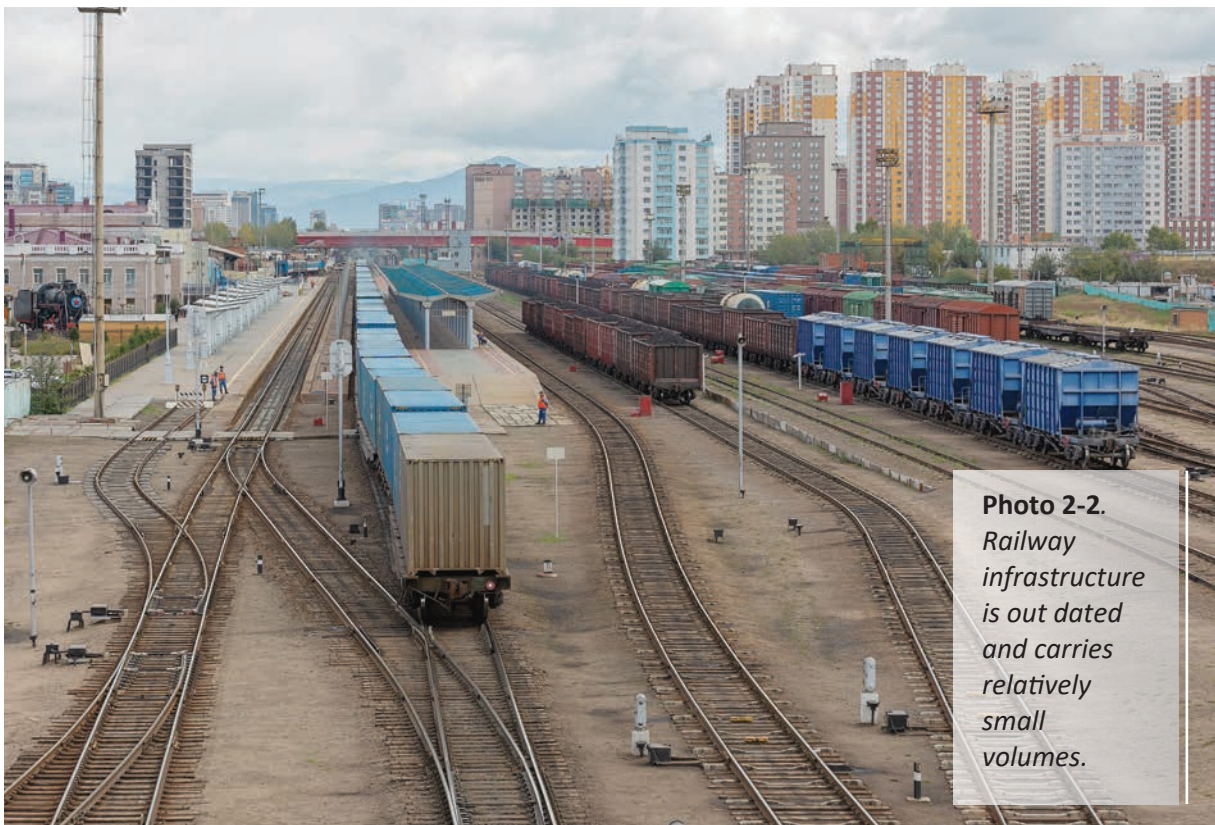


Photo 2-2.
Railway infrastructure is out dated and carries relatively small volumes.

border crossing points across Mongolia. Another key issue affecting the movement of goods across borders is the variation in the railway gauge of Mongolia and China, which necessitates the transfer of freight between railway wagons of different gauges at border crossing points. This transfer takes place manually.

The Trans-Mongolian Railway is vulnerable to damage from natural disasters (Mongolia Ministry of Nature and Environment, 2020). All of Mongolia sits in an active seismic zone. Earthquakes of at least magnitude 6 on the Richter scale occurred more than 40 times during the last two decades. Earthquakes more powerful than magnitude 8 occurred only four times in the 20th century (Rossetti). During heavy rain, rail bridges can be damaged by flood scouring of embankments and bridge abutments. Snow and blowing snow can cause delays as ice accumulates on rail switches, brake riggings, track flangeways, and grade crossings, reducing control and increasing the risk of derailments and other types of incidents. The wheels of locomotives and railcars are at risk for slipping, sliding, and losing control on tracks coated with ice or frost (Young 2019).

Despite legacy investments in the broad-gauge railway and time-consuming trans-loading at the Chinese border break of gauge, Mongolia maintains relatively high rail volumes on the Trans-Mongolian Railway. Table 2.2 highlights the main characteristics of the rail line along the route.

Several previous reports have highlighted the importance of this central railway line as the backbone for rail-based freight traffic along the central corridor. Given the long transport distances in Mongolia (on average 600 kilometers) and the quantities of mineral products, these bulk minerals could provide an anchor for reliable railway services. The main recommendation has previously been to fully upgrade the existing rail line by investing \$7–\$11 billion to upgrade the railway line into a double-track electrified line. Doing so would be neither affordable by Mongolia nor justifiable to meet current demand. Moreover, it is not obvious that such investments in infrastructure would lead to modal shift, as most rail-friendly freight is carried by trucks. Although rail is a cheaper mode of transport, most shippers prefer to use trucking

Table 2.2 Characteristics of the Trans-Mongolian Railway

Characteristic	Details
Total length (kilometers)	1,110
Line type	Single track with passing loops
Track gauge (kilometers)	1,520
Track form	Conventional ballast and sleepers
Carrying capacity (million tons a year)	25
Throughput capacity (number of bidirectional trains per day)	14
Number of wagons	6,577
Number of Locomotives	182
Maximum speed for freight (kilometers/hour)	80
Maximum train mass (tons)	6,000
Maximum speed for passengers (kilometers/hour)	90

Source: Ministry of Road and Transport Development of Mongolia 2018.

services because of the service reliability of trucking relative to railways. The limited freight moved by rail reflects inefficient services rather than a lack of infrastructure per se. The current rail line, though in relatively poor condition, is capable of handling the existing freight volumes with some minor improvements. Mongolia has also invested in a communications based train control (CBTC) system with moving block technology that can be fully automated and driver less, which is currently underutilized. To improve freight rail volumes along the central corridor, a multidimensional solution that includes the complete rail system of track, signaling, and control system needs to be considered. Such a solution must be commensurate with demand and accompanied by a market-oriented service solution for specific customers.

2.3 Energy Infrastructure: Quality, Capacity, and Coverage

Energy is crucial for economic development. Network energy (in this context defined as electric power or heat) is critical for the development of economic value chains in sectors such as mining, agriculture/livestock, tourism, and digital services-the priority sectors identified in this report. Crucially, energy is also a value chain in itself. Network energy is produced in a process that first requires either mining fossil fuels or harnessing renewable resources and then processing/converting to electricity or heat (generation), after which the electricity or heat is transmitted over distance, distributed, and sold to consumers.

2.3.1 Energy Access

Electricity access in Mongolia improved significantly over the past decade. Today most of population has access to affordable electricity. The national electrification rate rose from 65 percent in 2005 to 83 percent of all households;¹⁸ all but one of the 331 *Soum* centers are connected

to the national grid, and their customers receive electricity at affordable prices. What drove this success was government initiatives to expand the electricity grid by pumping equity into distribution companies while keeping tariff levels low through government fiat. Virtually all herder families now have electric lights, televisions, and cell phones, thanks to the massive deployment of solar home systems between 2008 and 2012, aided by a government-subsidized program. However, obsolete infrastructure with limited capacity in many cases constrains expansion of power supply to meet rising consumer needs. Many small businesses outside Ulaanbaatar struggle to get connected or suffer from poor power quality and outages. Expanding grid capacity to connect new customers and improving reliability of power supply are therefore indispensable.

2.3.2 Power Generation, Transmission, and Distribution in Mongolia

Energy networks in Mongolia are supplied almost entirely by aging coal-fired combined heat and power (CHP) plants. The electric power network comprises five main energy systems, with a total installed capacity of about 1.4 GW. The Central Energy System (CES) is the largest, accounting for about 90 percent of total generation. In 2019, CHPs accounted for 92 percent of district heating energy nationally, with the remaining 8 percent coming from renewable hydro, wind, and solar resources.¹⁹ The total installed capacity of renewable energy plants in Mongolia is 238 MW, including 155 MW of wind, 60 MW of solar PV, and 23 MW of small hydropower.

Domestic generation facilities are unable to cover demand, inefficient, and susceptible to failure. CHP plants number 2 and 3 in Ulaanbaatar have been operating for over 40 years; CHP plant number 4 in Ulaanbaatar has operated for more than 25 years. Despite rapid demand growth during the last two decades, very limited generation capacity has been added; power imports have been bridging the widening gap

¹⁸ The semi-nomadic nature of Mongolia's many remaining traditional herder families should be considered when comparing this number with coverage rates in other countries. Many of the 17 percent of the population that is not connected are herder households without a fixed address.

¹⁹ The remaining 8 percent was generated by the Amgalan coal-based heat plant.

between domestic demand and supply. Domestic power generation covers 78.3 percent of Mongolia's total needs; the rest is imported from China (16.8 percent) and Russia (4.9 percent). However, the interconnection line from Russia that provides peak power and balancing services for the CES is coming near its capacity limit; new generation options are urgently needed. See table 2.3

Variable renewable energy (vRE) sources like solar and wind pose specific challenges to the absorption capacity of the transmission grid and the size of the power market. All large-scale vRE generation sites have been located in the Central Energy System (CES) and Southern Energy System (SES). A recent technical impact assessment by the National Dispatch Center (NDC) concluded that only about 250 MW of vRE can currently be integrated into the national grid. With 222 MW connected as of May 2020, this limit is close to being reached; as a 30 MW solar plant in Sainshand (financed by the European Bank for Reconstruction and Development) is expected to be connected shortly, the limit has de facto been reached. Already at the current level

of vRE penetration, the NDC often has to curtail vRE plants to maintain grid stability. Higher vRE development would require this intermittency to be balanced out. Solutions include more flexible dispatchable generation (such as from gas turbines), energy storage, or the ability to trade with interconnected countries to balance generation and demand during peak periods. Future solar and wind projects will have to be put on hold until the capacity of the network to absorb more vRE is increased. The cost of vRE is highly dependent on how the financing/developers are selected. Negotiated deals usually lead to high cost; auctions for competitive selection reflect market prices.

Long and overloaded transmission and distribution lines contribute to significant technical losses.²⁵ More than half of Mongolia's distribution lines are more than 35 years old, and another 30 percent were installed more than 15 years ago. Substations and transformers are dilapidated, and long overhead lines connect dispersed load centers. Rehabilitation and extension of the network has been limited, with the exception of a new transmission lines built

Table 2.3 Overview of Mongolia's power supply, 2019

Power system	Peak demand (MW)	Installed capacity (MW)	Energy demand (GWh/y) ²⁰	Transmission and distribution losses (GWh/y)	Domestic generation (GWh/y) ²¹	Internal transfers (GWh/y) ²²	Net imports (GWh/y) ²³
CES	1,153	1,298	5,033.2	867.2	5,722.1	-72.5	250.8
WES	37	12	127.7	40.9	44.8	-3.7	127.5
AUES	20	12	62.7	17.1	42.4	37.4	0.0
EES	49	36	254.3	10.2	205.5	58.8	0.2
SES	20	27	81.8	8.8	110.7	-20.1	0.0
Mines ²⁴	175	0.0	1,319.5	n.a.	0.0	0.0	1,319.5
Total	1,454	1,385	6,879.2	944.3	6,125.5	0.0	1,698.0

²⁰ This figure does not include transmission and distribution losses or ancillary use.

²¹ Net of ancillary use

²² Positive value means import from other systems, negative value means export to other systems.

²³ Figure includes net imports from China and Russia.

²⁴ Figure includes the OT and Nariin Sukhait mines in the South Gobi supplied by the Inner Mongolia Power Corporation (IMPC), which operates the 220-kV interconnection to IMPC's grid. IMPC constructed the line, but ownership was formally handed over to National Power Transmission Grid as part of the Southern Region Power Sector Agreement.

²⁵ Mongolia's transmission voltage levels are 220 kV and 110 kV, with distribution taking place at 35 kV, 15 kV, 6-10 kV, 0.4 kV, and 0.22 kV.

in the south mainly to enable power evacuation and reduce curtailment of wind power plants.²⁶ This obsolete infrastructure contributes to the significant losses in power transmission, in many networks exceeding 15 percent. System failure to supply power reliably results in frequent power outages. In 2018, the average duration of the power outages (System Average Interruption Duration Index [SAIDI]) was 62 hours, and the frequency of the power outages (System Average Interruption Frequency Index [SAIFI]) was 15, according to the ERC. In comparison, Kazakhstan has a SAIDI of 1.01 and a SAIFI of 1.7. Since 2017, outages have become more frequent and are now at the highest level since 2012, indicating systemic network stability issues.



Photo 2-3. *Overload transmission lines contribute to inefficiencies.*

Systemwide inefficiencies caused by inflexible generation units with limited load-following capability and scarce transmission connections between isolated grids are prevalent. The regional power distribution systems have reached their capacity limit and are in critical need of upgrading and capacity expansion. Power supply is not reliable, and the risk of system failures is high, deterring fast response to frequency and voltage fluctuations and the grid's ability to integrate intermittent power without causing systemwide disturbances. The security of the power supply and the ability to isolate system disruptions when they appear is limited. Interconnection of decentralized power systems with the CES would improve the flexibility and reliability of the system.

Throughout Mongolia, poor power quality and frequent outages are a serious constraint on business development. The World Bank is financing comprehensive upgrades of distribution networks in nine of Mongolia's 21 *Aimags* through its Second Energy Sector Project. This \$30 million investment will alleviate many immediate problems of power access in the affected *Aimags*. After completion of the project, the country's distribution systems will need to be upgraded, as pockets of wooden poles and pole-mounted substations that are more than 40 years old remain.

2.3.3 Heat Supply

Less than a quarter of Mongolia's population has access to central thermal energy provided by coal-fired CHP plants and boiler houses through district heating networks. Most households rely on decentralized heating sources, either coal-fired boilers in buildings in urban areas or individual coal-burning heating units in suburban and rural areas. The government has acknowledged that these solutions are unaffordable and unsustainable and that their use in suburban Ulaanbaatar is the main cause of the extremely high level of air pollution in the city. Several

²⁶ vRE plants, connected to substations located far from the load center and voltage criteria fluctuations are a main issue curtailing vRE (EBRD Action Plan).

programs have been implemented to reduce air pollution from traditional stoves, including the promotion of cleaner fuels and the introduction of about 180,000 clean stoves throughout the Ulaanbaatar *ger* districts and beyond. These efforts have been only partly successful.

District heating is a cleaner and healthier alternative than individual stoves. However, along with rapid population increase in cities from rural-to-urban migration, the share of households supplied from the district heating network in Ulaanbaatar has declined. In 2018, only two-fifths of the population (some 120,000 households) were connected.²⁷ In Ulaanbaatar, the primary and secondary district heating network is insufficient, unreliable, and dilapidated, as a result of lack of investment in needed rehabilitation and upgrading in past decades. Technical losses from the primary district heating network are above 19 percent, compared with 9 percent in Harbin, the coldest provincial capital in China. It is estimated that half of all transmission pipelines in Mongolia are in poor technical condition, urgently requiring replacement. The secondary (distribution) network has a variety of owners and operators and also requires major rehabilitation and replacement. Additional capacity has to be added to CHPs for generation. The heat transmission network is reaching its capacity limit, which has become the main constraint connecting new customers.

2.3.4 Power Market and Tariffs

Mongolia has a modified single-buyer power sector model that allow large arrears to be accumulated in a zero-balance account. The structure operates on a cash settlement system, in which distribution companies deposit collected electricity sales revenues into a zero-balance account from which generation and transmission companies are paid. When distribution companies reduce their deposits into the account in a case of collection shortfalls, thermal generation companies extend their payables to coal mines, placing pressure on their operations, or suspending payments to renewable energy generators. Over time, large arrears to generators accumulated, and revenue shortfalls of the zero-balance account were compensated by the state budget. Table 2.4 shows various tariffs.

The average end-user tariffs for power and district heating cover only the short-run marginal cost of service, leading to inability to finance system expansion from the balance sheet.²⁹ Electricity and heating tariffs are among the lowest in Asia and are not fully cost-reflective, constraining the ability to recover operating expenses and invest in rehabilitation and new generation. The financially strained sector depends on government equity for any major investment and direct or indirect government subsidies to cover operating expenditures (by selling coal from state-owned mines at prices lower than international market

Table 2.4 Power tariffs in Mongolia, as of May 2020

Consumer category	MNT/Wh ²⁸	\$/kWh
Mining and processing industry single-rate tariff	179.69	0.0629
Other industries and business entities single-rate tariff	164.38	0.0576
Residential single-rate tariff		
Less than 150 kWh/month	134.28	0.0550
More than 150 kWh/month	158.08	0.0546
Average power tariff	156	0.0545

²⁷ Heating Sector Improvement Project, World Bank, Project Appraisal Document, 2019

²⁸ All tariffs include a MNT23.79/kWh (\$0.083/kWh) feed-in tariff (energy levy).

²⁹ The average end-user electricity tariff in Mongolia is among the lowest in Asia, at about \$0.0545/kWh.

price, for example). Despite relatively high bill collection rates (about 95 percent), meter tampering contributes to commercial losses and shrinks companies' margins. Recent analysis of cost structures by the World Bank indicates that to achieve full cost recovery, the average tariff should be \$0.063/kWh, 12 percent higher than the current tariff of \$0.058/kWh. This increase is predicated on removal of the significant cross-subsidy from power consumers to heat consumers.

Heating tariffs for residential consumers are highly subsidized. Norm-based billing practices contribute to the financial instability of the heating sector and wasteful consumption.

Despite recent adjustments, consumer tariffs remain far below the cost-recovery level, requiring state subsidies for sector operators and cross-subsidies at various points along the entire heat supply chain. The biggest subsidy is the indirect subsidy for the power, which pays more than two-thirds of the shared costs of cogeneration. The lack of building-level heat metering and consumption-based billing practices at the building level, combined with poor building heat control and insulation, have led to wasted heat energy. Recent analysis of cost structures by the World Bank indicates that achieving full cost recovery, assuming the removal of the cross-subsidy from power, would require a tripling of the heat tariff. Such an increase would obviously have to happen gradually and with compensation to poor and vulnerable consumers. The impact on such a dramatic adjustment would have positive effects on energy efficiency along the entire heat supply chain.

2.4 Digital Infrastructure: Quality, Capacity, and Coverage

The ICT industry has seen rapid growth and structural changes since Mongolia transitioned to a market economy. The sector's development accelerated since its structural change in 2005 as part of the government's privatization

efforts. Since then, the market has been gradually liberalized and served by various competing players under a market-based pricing mechanism. Mobile services have underpinned the overall ICT development in Mongolia; its revenues make up over half of ICT sector revenues, which reached MNT1.26 trillion (\$441 million) in 2018. Between 2014 and 2018, total investment in the ICT sector reached MNT1 trillion (\$350 million) with 65 percent of the investment in mobile services and 14 percent in installation and maintenance of ICT infrastructure (Communications Regulatory Commission 2018). The incumbent operator, Telecom Mongolia, already experienced full structural separation: Telecom Mongolia became a service provider and Information Communication Network Company (ICNC, more commonly known as NetCom) assumed responsibility for the state-owned telecoms network.

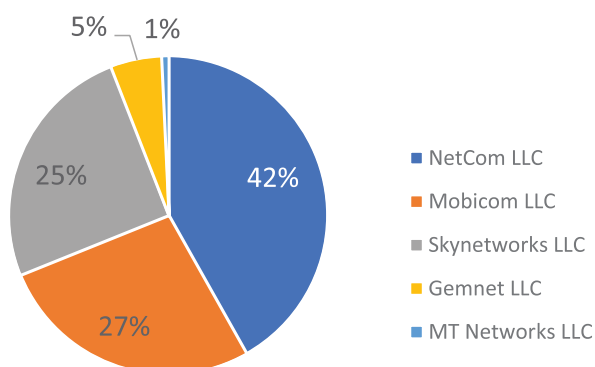
Despite the high cost of deploying ICT infrastructure to meet the needs of a sparse population spread across a vast land, Mongolia has high network coverage compared with its peer countries. Its backbone network covers over 43,000 kilometers of high-quality domestic fiber-optic networks (AIIB 2020). As of 2018, the capital city, 21 provincial centers, and 319 out of 330 *soums* were connected via backbone network fiber-optic cables of over 36,000 kilometers and metro network fiber-optic cables of over 6,000 kilometers. In addition, four VSAT (very small aperture terminal) operators provide services in 11 *soums*.

Mongolia's backbone network, the main infrastructure for digital connectivity, has been deployed by five network providers including public and private entities. The largest fiber-optic deployment which accounts for over 42 percent of the total backbone network, has been installed and is maintained by Netcom. Other providers-including Mobicom Networks LLC (27 percent), Skynetworks LLC (25 percent), Gemnet LLC (5 percent) and MT Networks LLC (1 percent)-make up nearly 60 percent (Figure 2.4).

Figure 2.4

Market share of fiber-optic network providers in Mongolia, 2018

Source: Communications Regulatory Commission 2018.



Mobile cellular subscriptions have been increasing, as Mongolia's unique geospatial features favors wireless technologies over fixed landline technologies. The country ranked 46th in terms of mobile cellular subscription rate in 2018 (ITU 2018). Mobile cellular subscribers are served by four telecommunications operators: Mobicom (38 percent), Unitel (34 percent), Skytel (16 percent), and G-Mobile (12 percent) (Figure 2.5). Out of these subscribers, 78 percent uses prepaid services. The mobile cellular subscription rate is expected to increase steadily in the next five years, thanks to the continued migration of users from fixed-line services to mobile services and increased demand for access to mobile applications and services in urban areas.

The number of mobile broadband subscriptions grew steadily between 2014 and 2018, thanks to the increased availability of mobile broadband-based services (Figure 2.6). Although the 3G network was widely used between 2016 and 2018, the 4G LTE network usage has picked up growth since its launch in 2016 (Communications Regulatory Commission 2016). Having widened accessibility of 4G LTE across 21 provincial capitals, the mobile broadband penetration rate is expected to grow strongly over the next five years. Mongolia's mobile-cellular penetration rate was 133 percent in 2019 which was significantly higher than the regional and global average. Given the high smartphone usage rate, mobile broadband services have become the

Figure 2.5

Number of mobile-cellular subscribers in Mongolia, by provider, 2014-18

Source: Communications Regulatory Commission 2018.

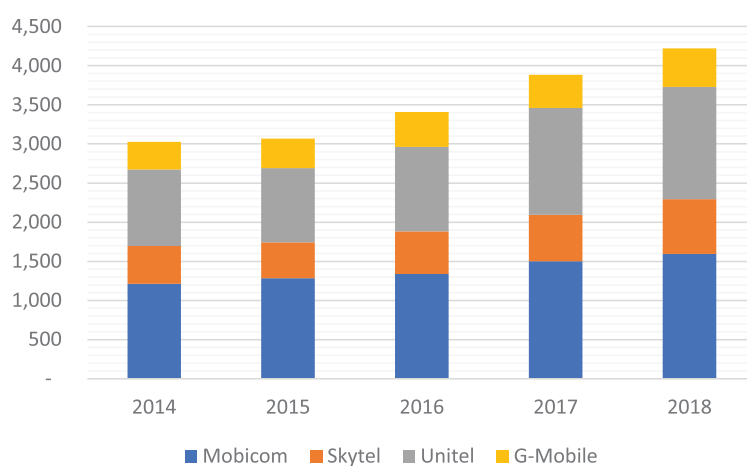
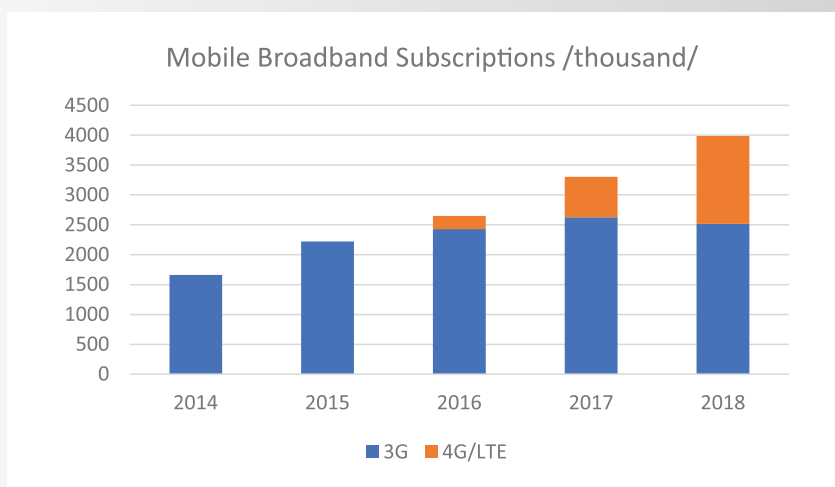


Figure 2.6

Number of 3G and 4G mobile broadband subscribers in Mongolia, 2014-18

Source: Communications Regulatory Commission, 2014-18.



most common and popular way through which Mongolian people access the internet. In 2019, 83 percent of the population had access to mobile-broadband services on par with the global and regional average.

More than 306,000 users are connected to the internet, 90 percent of them through the fiber-optic network. Connection speed ranges from 256 Kbps to over 10 Mbps, but most subscribers use 2-5 Mbps. With the increased availability of online services, traffic on the national fiber optic backbone network reportedly increased by a factor of 5.5 times between 2014 and 2018 (Tsolmondelger, 2019). As a result of the steady expansion and upgrade of the backbone network across the country, transmission network capacity increased by a factor of more than six of the 2014-2018 period. The increased high-speed bandwidth capacity creates more opportunities for rural communities living in isolated parts of Mongolia to receive a wide range of ICT-supported government services.

Given its unique geographic location, Mongolia provides one of the fastest transit routes for international bandwidth broadband services between Asia and Europe. Since 2011, Mongolian network providers have been partnering with

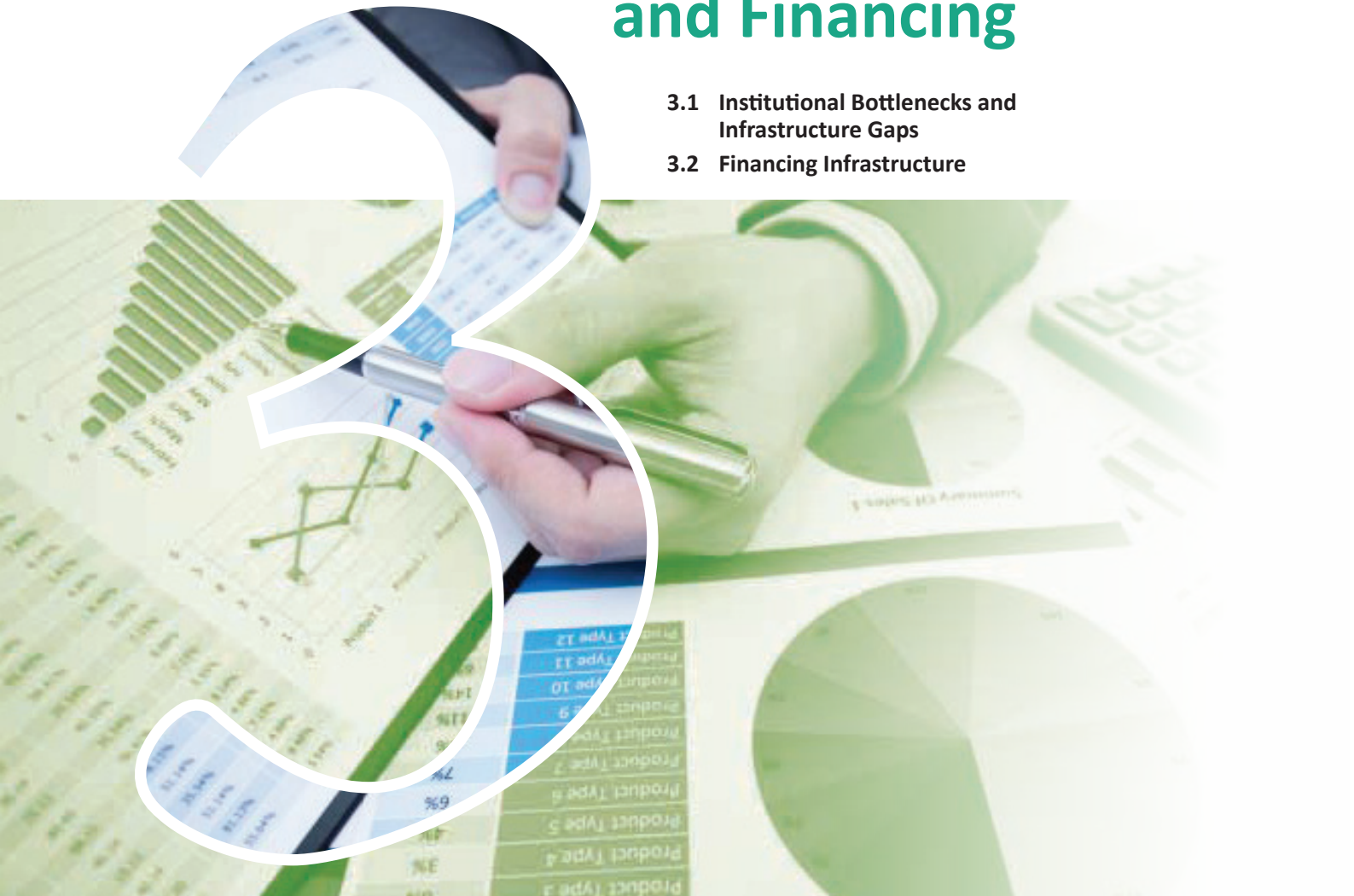
operators such as MegaFon, Rostelecom, and China Telecom to provide low-latency terrestrial network connectivity linking Asia and Europe through Sukhbaatar and Zamiin-Uud ports. The domestic fiber-optic network is connected to multiple networks of telecom operators in China (China Unicom) and Russia (TransTelekom) to be routed to overland Asia-Europe networks and submarine cables. However, digital infrastructure remains underutilized in Mongolia. It ranked 96th out of 141 countries for its ICT adoption on the Global Competitiveness Index (World Economic Forum, 2019). ICT adoption is rated higher than the country's competitiveness rank of 102, making it one of the better-performing sectors (World Economic Forum, 2019). Based on the sub-indicators' performances, it is evident that the ICT connectivity is high across the country, with mobile-cellular telephone subscriptions the highest, but overall internet penetration rate lags. Less than 24 percent of the population used the internet in 2018, which was much lower than the average of lower middle-income countries (34.7 percent) and EAP countries excluding high-income countries: 51.2 percent)³⁰ This was also highlighted in the ICT Development Index of the International Telecommunications Union in 2017.

³⁰ International Telecommunication Union (2018). "Individuals using the Internet (percent of population). (IT.NET.USER.ZS)." Retrieved from World Development Indicators.

Closing the Gap: The Role of Policies, Institutions, and Financing

3.1 Institutional Bottlenecks and Infrastructure Gaps

3.2 Financing Infrastructure



3

CLOSING THE GAP: THE ROLE OF POLICIES, INSTITUTIONS, AND FINANCING

3.1 Institutional Bottlenecks and Infrastructure Gaps

3.1.1 Summary of Key Institutions

Mongolia has a legal and institutional framework for infrastructure development that is not atypical of middle-income countries. Many relevant pieces of legislation have been adopted in the past two decades, with the assistance and advice of international financial institutions. Implementation of this legislation has often been weak, however, and coordination across government agencies in the planning, selection, and execution of infrastructure investments inadequate. Line ministries, departments, and sector agencies use a variety of avenues and mechanisms to bypass rules and spend more than the ceilings agreed under the budget approved by the Ministry of Finance. Its gatekeeping role, a key aspect of well-functioning infrastructure institutions, is substantially weakened and some investments are completely outside of its control. Major reforms and streamlining of processes are needed to bring discipline. The proposed new Ministry of Economic Development may be well placed to take a central coordinating and project development role; it should be granted resources to develop sufficient capacity to do so. At the same time, the Ministry of Finance should be

granted gatekeeper authority to review public investment or PPP projects with fiscal impacts, in line with international best practices.

The Mongolian government has produced long-term development strategies for some but not all sectors. The energy sector is guided by the “State Energy Policy 2015–2030,” adopted in 2015. The World Bank has been working with the Ministry of Energy to develop an Energy Sector Master plan whose findings and recommendations are aligned with the findings of this study. Other sectors do not have comprehensive plans that are linked to the national development plan. For example, the transport sector is guided by subsector policy documents such as “The Railway Policy of 2010” and “The Civil Aviation Policy of 2020”; it lacks a unified, long- and medium- term sector strategy that links investment projects to the national development program.

There is also a need for a lead institution to coordinate cross-sector infrastructure sharing, to reduce infrastructure deployment cost. Coordination is required for fixed assets such as land, improvements and fixtures across different sectors of the economy. Cross-sector infrastructure sharing might encompass the use of the same bridge to carry both a roadway and a railway across a river; the placement of roadways and electric distribution lines in the

same corridors; or the use of infrastructure by telecommunications network operators and owners of infrastructure developed primarily for purposes other than the provision of public telecommunications services, such as highways, electricity transmission lines, and pipelines. Cross-sector infrastructure sharing would yield significant cost saving. For example, passive infrastructure can constitute 70–80 percent of the cost of an overall investment in a fixed-access telecommunications network.

The project selection framework does not ensure that projects in the public investment portfolio are aligned with the priorities of the national and sector development strategies and plans. In the two-stage, scored, criteria-based screening and prioritization process of public investment projects, development strategies, policies, and sector plans have just a 6–9 percent weight in the overall scoring method; criteria such as the proposed projects' linkage to other projects, the project's capacity usage, the completeness of the project's cost, and identification of risks during project implementation count for much more.³¹

Within the policy framework, the key institutions of public investment planning are the following:

Parliament: Parliament is the highest-level approving body for the Medium-Term Budget Framework Notice, the annual state budget, and amendments to the state budget.

Government: The government prepares the Medium-Term Budget Framework, the annual state budget, and its amendments and approves annual budget limits and procurement plans for each budget administrators. It approves the annual national Public Investment Program and the Concession List.³²

Ministry of Finance: According to formal policy documents, the Public Investment Unit at the Ministry of Finance is the main body responsible for planning, budgeting, financing, and managing public investment projects at the national level.

National Development Agency: The National Development Agency (NDA), the successor to the National Development and Innovation Committee, is the government agency under the prime minister responsible for developing national long- and medium-term development strategies and plans and implementing FDI and PPP policies and programs. It also prepares the draft national Public Investment Program for approval by the government.

Industrial Development and Innovation Agency of the Municipality of Ulaanbaatar: The NDA equivalent agency at the Municipality of Ulaanbaatar (MUB) is the Industrial Development and Innovation Agency. It is responsible for implementing PPP policies and planning and overseeing PPP and concession projects for the city of Ulaanbaatar.

Sector ministries: Sector ministries are the policy-setting and regulatory bodies whose Policy and Planning Departments are responsible for consolidating investment project proposals from relevant agencies; carrying out the preliminary screening public investment project proposals; and identifying the sector prioritization for the annual public investment plan, which is subject to rescreening, reprioritization, and budget allocation at Ministry of Finance.³³

Municipality and provincial governments: Municipal and provincial governments are led by appointed governors and overseen by the elected City Council. These subnational government bodies are mandated to prepare

³¹ The weights are as follows: completeness of the project's cost (18 percent), proposed projects' linkage to other projects (15 percent), project capacity usage (15 percent), identification of risks during project implementation (15 percent) during each prioritization stage.

³² Capital investment project is defined as follows: "Those infrastructure and development investment projects aimed at ensuring economic growth for the long term with a value of more than MNT30 billion (\$10.5 million) which are to be implemented for the period of more than one year shall be included in the Capital Investment Program," as per the Budget Law of 2011.

³³ There are 13 ministries in Mongolia. However, it is common for the government to reorganize itself, usually after a new government forms after the parliamentary elections held every four years.

public investment plans on the basis of provincial or municipal development strategies and guidelines.³⁴ At the MUB, the planning, funding, and implementation of capital investment in Ulaanbaatar involves three levels of governments. MUB public entities submit project proposals. The MUB screens and selects capital investment requests by funding sources—the Ulaanbaatar city budget or line ministry budgets—and sends the requests to approving entities. Projects to be funded by the Ulaanbaatar city budget require approval by the City Council; projects to be financed by the state budget are sent to line ministries for another layer of screening and selection. As the last step, the Ministry of Finance reviews and includes selected projects in the annual budget allocations. For MUB, the capital investment planning process does not involve a clear selection and prioritization criteria (Kaganova and others 2018).

Erdenes Mongol: Erdenes Mongol is a state-owned entity that serves as the holding company for a broad range of state interests in mining, mineral processing, and infrastructure. It was established in 2009, initially to hold interests in OT (through Erdenes Oyu Tolgoi LLC) and Tavan Tolgoi (through Erdenes Tavan Tolgoi JSC). Over time, additional subsidiaries have been set up as vehicles for public investments. They now extend to several uranium joint ventures, including a steel-making joint venture, a road development joint venture, and a railway development joint venture. Some diversification into fuel supply, methane, and hospitality has taken place as well.³⁵ Through the board, the government is able to rely on Erdenes Mongol to lead strategic investments in mining and infrastructure and secure financing, from profits generated in mining or financing raised in capital markets. In late April 2020, an initial public offering (IPO) of shares in ETT was cancelled. Some \$1–\$1.5 billion had been targeted, to be deployed for the expansion and upgrading of Tavan Tolgoi and the financing of the railway to the Gashuun-

Sukhait border crossing. The Cabinet sets the infrastructure mandate of Erdenes Mongol, in decisions taken from time to time on strategic projects. The overall value of investments in its planning portfolio is about \$7–\$8 billion.

Ministry of Foreign Affairs: Several megaprojects as part of the CMREC are under the responsibility of the Ministry of Foreign Affairs. An agreement at the trilateral meeting on the sideline of the Shanghai Cooperation Organization Member States Summit in 2016 between the presidents of Mongolia, China and Russia led to consensus on the infrastructure needs. Subsequently, Mongolia selected 32 projects along the CMREC, including 13 transport projects. The three priority projects include the central highway, the central railroad, and the energy grid. Project preparation, appraisal, and procurement are being led by the Ministry of Foreign Affairs. The rationale for having the Foreign Ministry lead the projects is that the projects are cross-border in nature, requiring international cooperation to move ahead, and need to be coordinated with additional “soft” infrastructure, such as trade agreements, customs unions, and other enabling regulations and institutions. However, housing the projects entirely within the Ministry of Foreign Affairs further fragments the government’s capacity to review and assess projects and subject them to a transparent government process of preparing and procuring the projects.

Government Agency for Policy Coordination on State Property: The duties of the Government Agency for Policy Coordination on State Property (PCSP) are to enhance the management of state-owned assets, supervise and manage the state-owned assets of the enterprises under the supervision of the central government, and extend the procurement process to international standards for transparency and accountability. The agency is responsible for implementing policy and regulation governing state-owned assets within related law assigning or removing

³⁴ The guiding principles are the Mayor’s Action Plan, the City’s Master Plan, and the Socio-Economic Development Guidelines for Ulaanbaatar.

³⁵ Bauer and Namkhajantsan, NRGi 2019.

state property representatives in a state-owned enterprises, raising investment capital and organizing the IPO process, monitoring the preservation and protection of state-owned property and ensuring its efficiency, and carrying out capacity and institutional development of state-owned assets. This agency is a combination of the previous State Property Committee (1996-2016) and the Procurement Agency (2012-2016). Mongolia now has 102 state-owned companies and industrial companies, 83 of which are under the supervision of the Agency for PCSP, 13 of which are under the management and supervision of the Erdenes Mongol LLC, and 6 of which are under the Ministry of Finance.

This array of institutions is typical for many middle- and high-income countries. The problem in Mongolia is that the institutional framework for coordinating them is weak. As a result, the process of identifying, prioritizing, and implementing projects is fragmented, and the infrastructure developed does not ultimately achieve the desired impact at the aggregate level.

3.1.2 Project Planning, Identification, and Selection

Mongolia spends approximately 10 percent of its GDP on capital investment projects annually. It approved funding for 749 projects, with a budget cost of MNT2.16 trillion (about \$756 million), in 2019 and 1,281 projects, with budget cost of MNT3.2 trillion (\$1.12 billion) in 2019. This level of investment is low given the country's ambitious plans to upgrade, expand, and improve its soft and hard infrastructure. In transport sector alone, the government planned to invest in over 6,300 kilometers of railways to improve regional connectivity and increase the length of its road network by 40 percent between 2016 and 2020. This plan is presented in various policies governing the transport sector but without the financing source identified.

The efficacy and impact of spending on national development is not properly measured, and shortfalls are associated with the investment project planning and selection practices. The process of capital investment planning in Mongolia

Box 3.1 Opportunity to reduce institutional fragmentation

There is a window of opportunity for Mongolia to resolve the institutional fragmentation. Vision 2050, Mongolia's long-term development policy is a comprehensive policy document that underpins the development priorities set forth by the previous cabinet upon a series of consultations with scholars and stakeholders. Approved in May 2020 prior to the General Election, the Vision 2050 also served as a basis for the manifesto of the MPP, the ruling party that won a landslide victory by securing 62 parliamentary seats out of 76 seats. Some of the key actionable points in the manifesto include economic diversification through export-oriented production, mainly in the fields of mining and agriculture and the development of 2300-km-long transport infrastructure. The InfraSAP's value chain analysis with respect to infrastructure development could play a significant role in translating the incoming government's aspirations into an action plan.

Assessing Mongolia's development path for the past 30 years and existing opportunities to improve the competitiveness of Mongolia, Vision 2050, Mongolia's long-term development policy broadly addressed the underlying need for strengthening governance in order to improve efficiency and accountability of the public sector, ensure continuity of state policies and promote PPPs to operationalize some of the planned mega-programs such as the establishment of the regional economic corridor. In this regard, establishing a Ministry of National Development would help centralize the coordination and implementation efforts of the long-term development policy. Diagnostic findings of the InfraSAP offers a set of policy recommendations including improved PPP framework and institutional coordination mechanisms to achieve such goals and aspirations set forth by the Vision 2050.

The Vision 2050 has 9 goals and 50 development targets, which are divided into three timeline horizons of 10 years for 2020-2030, 2031-2040, and 2041-2050. It is the most recent yet most ambitious policy framework that charted the development priorities beyond the Sustainable Development Vision 2030.

is characterized by project proposals submitted by line ministries with inconsistent linkages to sector or strategic planning, predetermined as public or PPP financing; insufficient project appraisals, related to the lack of standard project selection and screening guidelines; and weak linkage of capital budgeting and public investment management (PIM) planning and appraisal. Shortfalls include incoherence of strategic policies, exacerbated by impromptu cancellations or new policies; misalignment of budgeted projects with sector priorities; approval of projects with no feasibility studies; deferment of budget for ongoing projects during budget planning; and the lack of consideration for cost and benefit of public investment projects.

There are at least three tracks for selecting capital investment projects. According to the Budget Law, all capital investment projects that cost more than MNT30 billion (about \$10.5 million) and are implemented for more than one year are screened for the qualification in the Public Investment Program (PIP), which is under the responsibility of the NDA. Projects below that threshold are implemented separately, through the annual capital expenditure budget, which is under the responsibility of Ministry of Finance. Thus, despite holding a key role as the budget holder for the government, the Ministry of Finance is responsible only for projects that do not meet the PIP threshold. PPP projects follow a third track, discussed in section 3.1.5.

To allocate resources efficiently, the government should screen projects before a funding source is determined, so that the most suitable funding source is allocated to each project. In theory, the NDA is responsible for screening, appraising, and prioritizing proposals and allocating a suitable funding source. The NDA is also responsible for conducting feasibility studies and technical design drawings for all projects in the PIP. However, resources to conduct feasibility studies are contingent on budget allocation from

the Ministry of Finance each year. It remains challenging for NDA to organize and conduct these assessments caused by their limited capacity and lack of resources.³⁶ Perhaps as a result, over 70 percent of PIP projects already had a funding source identified by the project proponent at submission. Most determinations were made without any study or criteria to justify the decision.

Every year, the Ministry of Finance receives thousands of project proposals for small-size projects from line ministries for the annual budget formulation. Historically, the Ministry of Finance lacked the capacity to evaluate and screen each project in line with the budget formulation timelines. A step forward was achieved in December 2018, when the ministry approved the *Procedural Guideline and Methodology for Project Screening and Evaluation*. The guideline indicates that PIP projects funded by the state budget should be screened, prioritized, and selected using a two-stage process at line ministries and/or agencies and at the Ministry of Finance. The prioritization is based on score-based criteria that evaluate projects based on relevance to national and sectoral development policy, project readiness, and economic and social returns. This legal mandate applies only to projects under the Ministry of Finance's responsibility—that is, with a total cost of less than MNT30.5 billion (about \$10.7 million).

For the first time, a PIP list consisting of 149 projects totaling MNT54.585 trillion (\$19.12 billion) for 2018–21 was developed and approved. (Table 3.1) Most of the projects on the list were already under implementation by the project owners, with only 47 new projects added. Projects were submitted to the PIP by line ministries, with relevant feasibility studies and preferred funding sources already identified. It is unclear whether the criteria were applied in a consistent manner.

³⁶ Established in 2016, the NDA reports directly to the Prime Minister's Office and is in charge of developing a comprehensive development policy for Mongolia's Sustainable Development Vision. It is responsible for investment promotion, Public Investment Program (PIP) development, and PPP implementation.

Table 3.1 Funding sources for the Public Investment Program, 2018-2021

PIP funding sources	Total budget (MNT million)	Number of projects	Percentage in PIP 2018-21
State budget	2,025,729	18	5
Foreign loan and grants	6,224,851	54	10
Combined sources	7,629,674	20	15
PPPs excluding BTs	8,726,586	12	20
Mongolia Development Bank and private sector	12,492,067	14	11
Combined sources (uncommitted)	3,156,409	3	9
Unidentified sources	14,329,544	28	30
Total	54,584,862	149	100

Source: PIP 2018–2021.

3.1.3 Engineering and Project Preparation

The Budget Law requires that all capital investment projects included in the annual budget have a feasibility study conducted, technical specifications approved, and all required permits (that is, land) granted. Ministry of Finance Resolutions No.295 and No.282 for prioritization and selection of projects give weight to projects that have estimated the economic and social benefits, costs, and capacity (of the plant). These regulations specify that projects with budget cost exceeding MNT30 billion (\$10.5 million) should have a full cost-benefit analysis, projects with estimated budget cost of MNT15-30 billion should have a simplified cost-benefit analysis, and projects estimated to cost less than MNT15 billion (\$5.25 million) should have a least-cost analysis for comparison purposes. However, there is no dedicated pool of funding for the completion of such studies. The cost associated with completion of a project feasibility study (required for capital investment projects) becomes a separate line item in the state budget and is treated like a “project” in the public investment planning process, which also creates delays.

In practice, many projects make their way to the annual public investment plan and national

budget without project feasibility studies. In 2018, for example, 341 of the 749 projects approved for public investment budget (46 percent) did not have a feasibility study (National Audit Office, 2019). The capacity of government agencies to prepare high-quality technical specifications is weak, and this weakness is often reflected in the quality of the infrastructure built. The preparation of technical specifications of an approved project is either prepared in-house by the budget administrator or tendered out as a consultancy service. For larger infrastructure projects, it is best practice to use international consultants if domestic consultants do not have the experience to conduct complex feasibility studies. However, there are often no resources to do so.

3.1.4 Project Procurement and Implementation

The primary method of procurement for public investments valued above the government-set threshold is lowest relative bid price. The Procurement Law specifies that the bid administrator may take the monetized values of criteria other than the bid price into account, however in general the lowest bid price is the determinant.³⁷ Line ministries publish an annual

³⁷ Factors affecting the economic return of the project include date of delivery; operating expenses or economic return; after-service; warranty or guarantee; quality or technical specifications of goods or services; and others.

procurement plan at the beginning of each fiscal year. Depending on the value of the bid, either line ministries or affiliate agencies/districts/provinces administer the bidding. Invitations to bid are announced openly. Projects valued at less than MNT10 billion (about \$3.5 million) are open only to domestic bidders. As of 2018, 1,055 projects had been procured and about 81 percent consisted of open competitive bidding, almost 7 percent were direct contracting, and the rest were limited and relative tender processes (National Audit Office 2019).

Capacity for monitoring project implementation is weak across government agencies, as evidenced by the large number of projects that are behind schedule. Of the public investment projects approved for 2018, 72 percent are behind schedule. The delay is often associated the procurement process and contracts being signed toward the end of the construction season, causing delays in construction. Non-implementation is linked to failure of procurement, failure to sign the contract, and nonperformance of contractors.

3.1.5 Public-Private Partnerships

Despite the government's efforts to bring in private investment in infrastructure through PPPs, Mongolia has not seen significant results in project implementation. A Law on Concessions has existed since 2010, but few PPP transactions have appropriate risk allocation between parties and significant private capital mobilization. Although there are successful cases of private sector investment in Mongolia-in renewable energy, ICT, and mining, for example-most projects were implemented through direct private investment, not PPPs.

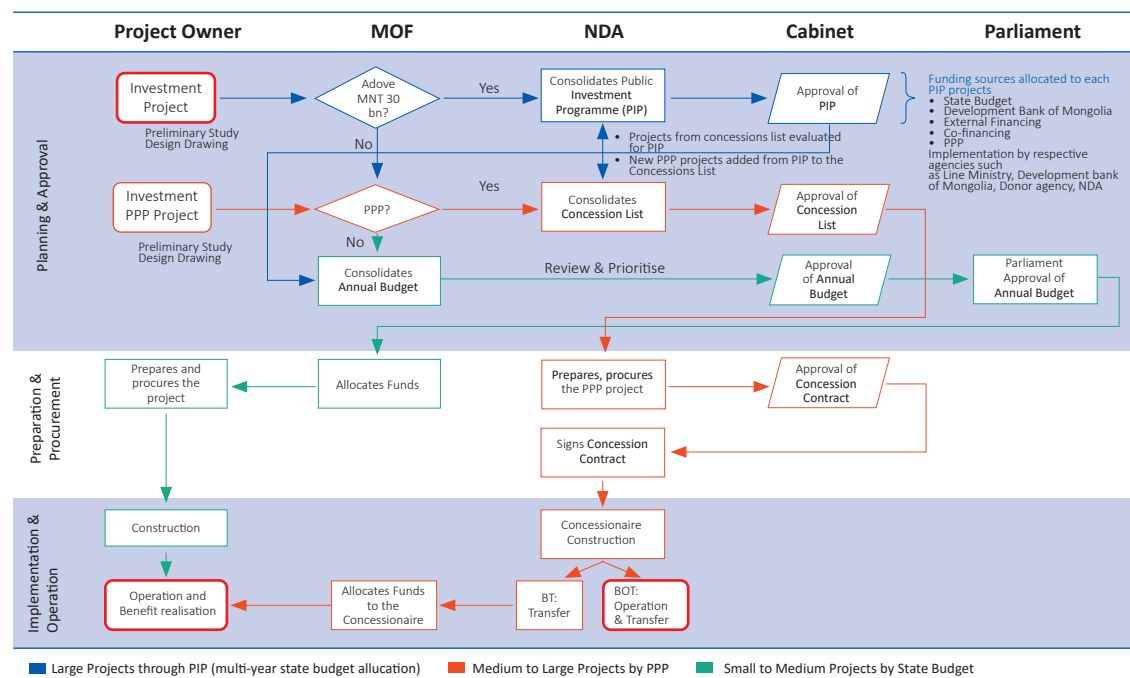
An ongoing Concessions List indicates the concessions being prepared, under procurement, or completed. The Concessions List currently contains 242 projects. According to the review by the National Audit Office, it was revised 49 times between 2014 and 2017, with projects added, taken out, or modified (National Audit

Office 2018). For PPP, projects have historically been determined by the project owners. It is unclear how a project is selected for preparation and procurement, though selection often seems to be politically motivated. Project owners or the PPP Unit do not carry out PPP feasibility assessments, cost-benefit analyses, or other background analysis before recommending the project to the Concessions List. In theory, under the new regime the NDA should act as the central clearinghouse for capital projects, by screening, assessing, and allocating projects to either the state budget or PPPs based on the feasibility and commerciality of the proposed projects. The NDA is responsible for drafting both the PIP and the Concessions list for government/Parliament approval. In 2015, the Budget Law was amended to include PPPs in the PIP, where projects in the Concessions List above the MNT30 billion (\$10.5 million) threshold are subject to PIP review (in the 2018-2021 PIP, 16 projects made it onto the list). This is a first step toward integrating the three pipelines of projects. However, separate pipelines of projects - namely, Concession List and annual capital expenditure budget - are still in force, and line ministries still tend to pick the track that is most convenient, rather than following a principle of allocation that maximizes private financing over public resources. Figure 3.1 shows the process for developing publicly funded infrastructure projects.

Mongolia often implements capital projects through PPPs, not for efficiency reasons but in order to overcome budgetary constraints (World Bank 2016). It has been a common practice that projects selected in the annual budget end up being "identified" as PPP potential projects, suggesting that only projects of lower priority are procured as PPPs. This can be seen in the fact that more than half the projects on the Concessions List - 172 projects - were proposed to be carried out as Build-Transfer (BT), which is not an internationally recognized form of PPP, as it does not allow for sufficient risk allocation to the private sector but instead is a form of post-paid public financing. More than 60 BT agreements

Figure 3.1

Capital investment processes in Mongolia



have been signed to date, mainly in school and road construction. On average, BTs are more expensive than similar projects funded through public finance. In some cases, road construction projects can cost up to six times more than projects financed by the state budgets.³⁸ In 2018, approximately 1 percent of the national budget was spent on payments for concession contracts.

Few of the 242 projects on the Concessions List have been implemented. Only 42 BT agreements and 15 non-BT agreements (BOT, BOOT, ROT etc.) totaling MNT17.24 trillion (\$6 billion) have been signed.³⁹ They include 16 road and bridge projects (2,000 kilometers), 18 schools and kindergarten buildings, 1 hospital, 2 cultural buildings, 2 railway lines and terminals, 11 power station and transmission lines, 4 urban water supply, 1 equipment supply, and 1 mining site development. Of these, one BOT and 23 BT

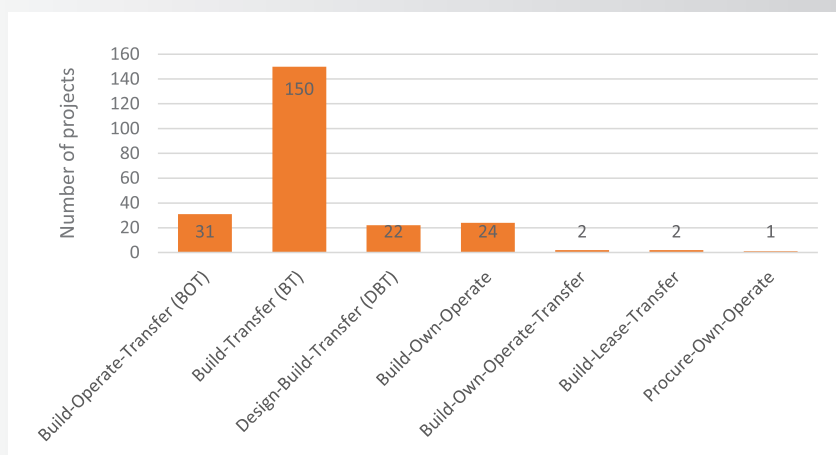
projects are operational. The operational BOT project is the 50-kilometer mining road between Shiveekhuren and Nariinsukhait. Operational BT projects include kindergartens, schools, hospitals, and roads. Although the energy sector has the largest amount of investments, only the 220kw transmission line and the capacity expansion of the Choir substation projects are operation. Only 2 percent of the PPP investment in the sector has been completed. Energy megaprojects, such as CHP5, the Baganuur Power Plant, the Teyshin Gobi Power Station, have been cancelled, suspended, or delayed. Because of the complex nature of the power projects, which include a wide range of agreements, including power purchase agreements, off-take agreements, the negotiation and contract awarding processes take a long time to finalize, or projects get suspended or cancelled.

³⁸ World Bank. 2018. Public Expenditure Review - Growing without Undue Borrowing

³⁹ Data as of June 2018, as registered with the Ministry of Finance.

Figure 3.2

Types of public-private partnerships in the Concession List



There are no systematic approaches to procuring the projects on the Concessions List. According to the Concessions List template, the preferred procurement method was direct contracting. Although direct contracting is meant to be granted only in exceptional cases, 53 percent of projects (123 out of 249) were predetermined to be procured through direct contracting.⁴⁰ According to the National Audit Office (NAO), between 2013 and 2017, about 60 percent of the competitive biddings conducted by the PPP Unit failed and were converted to direct contracting.⁴¹ Poor project preparation and difficulties for private bidders to secure the necessary financing are the main reasons given for failure of competitive procurement, even in the case of BTs. The NAO finds no documentary evidence on how the private partner was identified and selected for direct contracting.⁴² In June 2019, for example, the government cancelled three concession agreements after the private sector failed to raise the necessary financing. The agreements included the Altanbulag-Ulaanbaatar-Zamiin Uud highway project and a school and kindergarten complex.

Although the Concessions Law follows international standards, its implementation in the broader framework is weak. Besides the

Concession Law (2010), the legal framework also includes laws such as the Budget Law (2011), the Debt Management Law (2015), the Fiscal Stability Law (2010), the State and Local Property Law (1996), and the Development Policy Planning Law (2015). Within this wider framework, there needs to be a strengthened role for the Ministry of Finance; budget integration; and clear mechanisms on contract management, risk allocation, and government guarantees. Article 30 of the Concession Law lists government support to PPP projects, such as equity injection, loan guarantee, tax and other credits, insurance, minimum revenue guarantee, and viability gap payment. In practice, however, no forms of government support have ever been used, nor have procedures, guidelines, or institutional arrangements been specified by the PPP Unit or the Ministry of Finance for using such instruments. In addition, Mongolia's budget formulation and execution are rigid, which hinders performance-based fluctuating payments. No mechanism is in place to monitor the performance of the PPPs; and availability payments or performance-based guarantees are therefore not widely in use. This is an obstacle to the implementation of complex PPP projects.

⁴⁰ Government of Mongolia (2013) Concessions List

⁴¹ NAO (2018) National Audit Office. 2018. Концессын тухай хуулиар төрийн өмчийн концессын зүйлийн жагсаалтад батлагдсан арга хэмжээний хэрэгжилт, үр дүнд хийсэн гүйцэтгэлийн аудитын тайлан. www.audit.mn

⁴² National Audit Office (2018) Концессын тухай хуулиар төрийн өмчийн концессын зүйлийн жагсаалтад батлагдсан арга хэмжээний хэрэгжилт, үр дүнд хийсэн гүйцэтгэлийн аудитын тайлан. www.audit.mn

The lack of adequate project identification, screening, due diligence, and implementation of PPPs can be explained by the lack of capacity and continuity of government agencies responsible for PPPs. Since the adoption of the Concession Law, in 2010, the PPP Unit has been moved and restructured five times, resulting in frequent changes in personnel, and loss of accumulated knowledge and institutional memory (Table 3.2). Changes in office space and staff also result in loss of essential documents and databases. The Concession Law has had more than 20 amendments regarding its institutional structure, function, and power, and it may be changed again. Changes to institutional structure and key personnel are not limited to the PPP Unit but are prevalent throughout government. Fragmentation has an impact on capacity of many departments. The current PPP Unit consists of five people, including the department head, the division head, two senior specialists, and one specialist. Because of their complex nature, infrastructure projects require advanced and specialized skills - in finance, engineering, the law, and project management - which are commonly acquired through external advisors. The NDA and MoFA lack the resources to hire external expertise or specialist consultants to supplement their work. A recent NAO report found that only one specialist from the PPP Unit evaluated the PPP competitive bidding proposals (NAO 2019). Several international organizations-

including the Asian Development Bank, the Japan International Cooperation Agency (JICA), the International Finance Corporation (IFC), and the Global Green Growth Institute (GGGI)-provided capacity-building technical assistance to the government on infrastructure projects and PPPs. Frequent institutional reorganization and low staff retention rate have hindered the impact of such capacity building.

The NDA and the Ministry of Finance have no formal coordination mechanism. As a result, the Ministry of Finance has minimal oversight over PPP projects. The Ministry of Finance should play a key role in determining the Concessions List, in order to ensure fiscal affordability and manage fiscal risks. However, the Concession Law states that Ministry of Finance's role is limited to providing comments to the Concessions List before government approval and executing concessions repayments.⁴³ There is no guarantee that its comments will be addressed. The Ministry of Finance is not involved in the procurement or contract-signing processes; it is informed about PPP projects only when construction is complete and any payment is due (Figure 3.2). Although in practice, some ministries informally seek the ministry's opinion before submitting projects to NDA, critical roles and responsibilities of both NDA and the Ministry of Finance need to be formalized and rationalized throughout the project cycle.

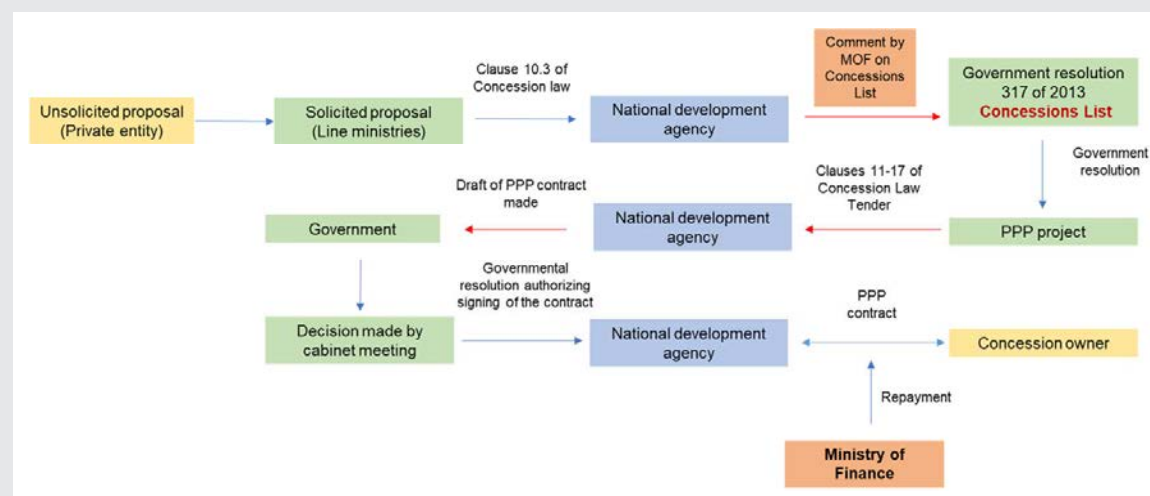
Table 3.2 Reorganization of Mongolia's public-private partnership unit

<i>Period</i>	<i>Institution in charge</i>	<i>Number of staff</i>	<i>Remark</i>
March 2010–September 2012	State Property Committee	8	First PPP unit in Mongolia
September 2012–October 2014	Ministry of Economic Development	15	
October–December 2014	Ministry of Finance	Not available	Transition arrangement for two months
December 2014–July 2016	Invest Mongolia Agency	8	Under Prime Minister's Office, but contract signing delegated to Minister of Industry
August 2016–present	National Development Agency	5	Under Prime Minister's Office, with contract- signing authority

⁴³ Articles 6.2.13 and 30.6 of the Concessions Law

Figure 3.3

Ministry of Finance involvement in the public-private partnership project processes



Source: Adapted from the Ministry of Finance (2019) Concessions Presentation.

3.2 Financing Infrastructure

3.2.1 Limitations on Public Sources of Funding

3.2.1.1 Government revenues and government debt

Governments can fund public infrastructure through revenues, sovereign loans or bonds (to be paid for by taxpayer revenues over time), or user fees. All these options are relatively restricted in the near term, reflecting the size of Mongolia's economy and the constraints placed by an already elevated level of public debt.

Mongolia's revenues are not sufficient to fund significant capital expenditures. Total revenues in 2017 amounted to \$3.5 billion, of which approximately 8 percent was used for capital expenditures (\$300 million). Most projects were small education or health projects, road upgrades, or other public works. Following the advice of the IMF, the government is working on a series of reforms to expand its revenues, such as increasing taxes and duties on fuel, tobacco, and cigarettes; increasing the retirement age; and introducing income tax on interest earned on savings. In the near term, however, revenues are not expected to be a significant source of capital for large projects. The amount of central budget

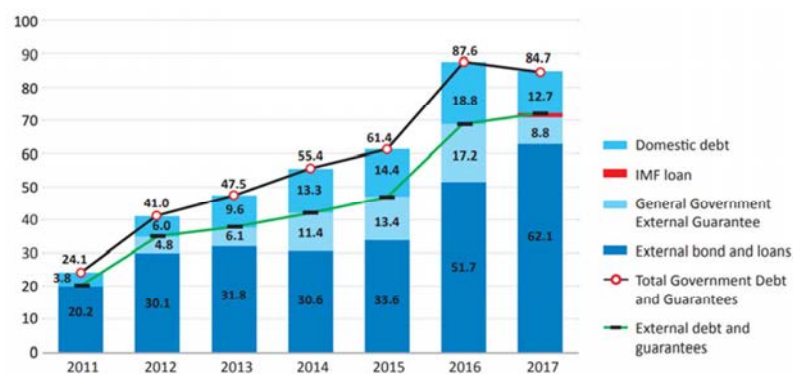
funding for capital investments in infrastructure is insufficient. For example, central government budget funding of capital investments to the energy sector averaged MNT87.5 billion (\$30.6 million) a year between 2010 and 2017, including investments, foreign-funded investments, and maintenance. During the same period, capital spending on the sector averaged 9 percent of total spending, on a par with the expenditure for the health sector and less than expenditure on education. Over the years, funding to the energy sector has been increasing. In 2017, it was the highest among all sectors, accounting for 11 percent of total capital spending. Thus, the volume of public funding to energy is already maximized, given needs in other sectors. As the amount available is not enough to fund significant new assets, other sources of funding need to be crowded in.

The fiscal space to further allocate resources for public-led investments is constrained. In 2016, government debt reached 87.6 percent of GDP, caused by the sharp decline in government revenue and the expansionary fiscal policies in place since 2012 (Figure 3.3). Subsequently, the government adopted the Economic Recovery Program, supported by an international aid framework of \$5.5 billion to ease pressure on

Figure 3.4

General government debt as a percent of GDP in Mongolia, 2011-17

Source: World Bank



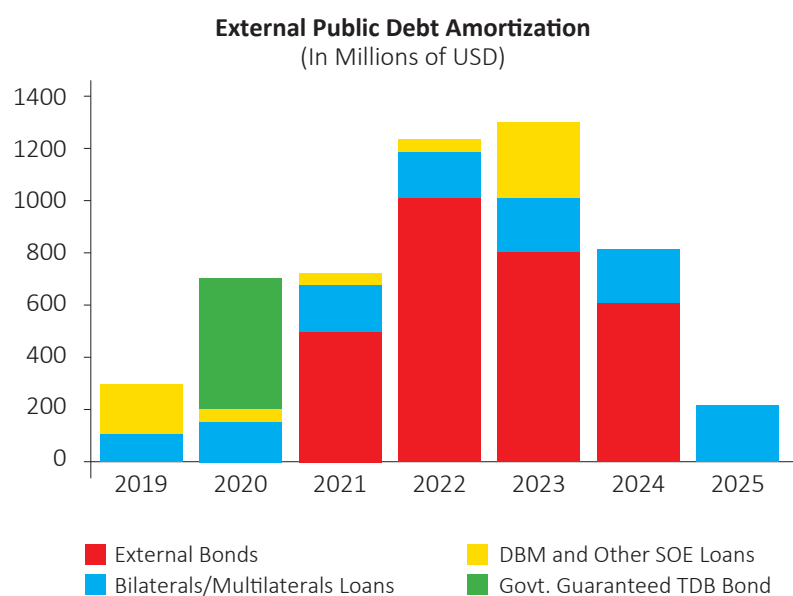
its external position and stabilize debt levels. The program set forth a public debt ceiling of 60 percent of GDP and required strict fiscal discipline, through substantial cuts in public spending. The government made substantial progress in the framework of implementing the program in recent years. Public debt in 2018 declined to 74.4 percent of GDP. The impact of COVID-19 has reversed some of these gains. Continued fiscal conservatism can be expected in future years, leaving limited room for debt finance of public infrastructure investment.

As of 2019, the government had outstanding debt obligations of over \$1.7 billion maturing during 2020-2025 (Figure 3.4). Most of these credits were obtained by the government, although several commercial credits were obtained by state-owned entities, including the Development Bank of Mongolia and Mongolian Airlines, that were guaranteed by the government. Some of these borrowings have a floating interest rate of more than 6 percent. Therefore, any additional fiscal space - created, for example, by a strong economy-would likely be used first to service these debts.

Figure 3.5

External public debt amortization in Mongolia, 2019-25

Source: IMF Staff Calculations



In 2007, the government adopted a policy mandating the state to contribute to new investments in strategic mining projects. It resulted in successive governments assuming substantial liabilities on behalf of mining interests. The dividends these investments may generate are likely to accrue only several years later. The resulting gap has imposed high fiscal costs and diverted public resources from other priorities. (Section 3.2.2, on diversifying sources of infrastructure finance, discusses this policy.)

The public liabilities entered, managed, and discharged on behalf of the government's mining interests lie outside the main PIP. To the extent that the state's investment portfolio results in a net liability, these liabilities will have an impact on overall fiscal space and borrowing capacity. Erdenes Mongol's interests in strategic deposits and associated infrastructure are already substantial; its plan of additional investments is on the order of \$7–\$8 billion over the next three to five years. The government will need to consider how it will fund these investments in addition to the other investment needs.

3.2.1.2 Official development assistance and bilateral loans

Mongolia has made use of various forms of public financing, including bilateral loans, sovereign bonds, and official development assistance (ODA). The flow of ODA tends to

reflect Mongolia's boom and bust cycles, with less flowing during the booms and more during the busts, averaging about \$300–\$700 million a year over the last 10 years. In 2019, 132 projects were planned, with more than \$400 million of ODA, of which 88 percent was concessional loans. Out of this amount, about 40 percent was allocated to infrastructure projects, particularly in roads and energy projects. The Asian Development Bank is by far the largest donor (42 percent), followed by China (21 percent), Japan (12 percent), and the World Bank (10 percent) (Figure 3.5). Given debt caps, ODA is unlikely to increase by a significant amount in the near term, though it continues to present an important source of capital for infrastructure development.

3.2.1.3 The Development Bank of Mongolia

The Development Bank of Mongolia (DBM) was established in 2011 as a state-owned limited liability company to finance megaprojects that have strategic importance to the economy but are not commercially viable (Table 3.3). Since then, it has raised approximately \$2.5 billion (MNT7.1 trillion) in the international market, through various funding instruments, such as bonds and syndicated loan facilities with interest rates as high as 7.25 percent.

Figure 3.6

Official development assistance loans and grants by major development partners, 2019

Source: Ministry of Finance

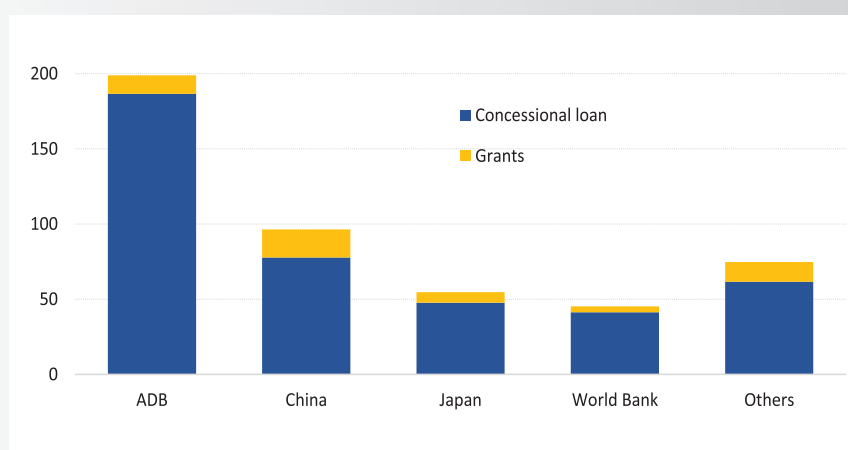


Table 3.3 Debt incurred through extra-budget funding of investment projects by 2016

	Debit Incurred	Repaid	Outstanding
Promissory Notes	658	658	0
DBM (Non-commercial)	2,528	20	2,508
BT	2,200	72	2,128
Total	5,386	750	4,636

Source: World Bank

The DBM operated as a major off-budget investment vehicle during 2012–2016, with allocations averaging 5.2 percent of GDP, bypassing state budget spending limits. Almost all-95 percent-of DBM's net lending (MNT2.4 billion) was issued for infrastructure projects, mainly road construction (Table 3.4). Though this spending helped the country develop some critical infrastructure, DBM faced debt sustainability issues that were later refinanced through several credit lines. Against the backdrop of amounting nonproductive loans and DBM's accumulating indebtedness, 348 existing noncommercial projects were transferred to the respective line ministries, in an effort by the government to consolidate fiscal expenditures as part of the Extended Fund Facility commitments.

Unrestricted access to extrabudgetary funding can lead to the development and execution of unsustainable volumes of poorly appraised and costly public investment projects. Bypassing central review allows line ministries to select projects through unsolicited proposals and define the terms via bilateral negotiations. As a result, competitive tender selection requirements may be disregarded, project identification may not follow consistent infrastructure development plans underpinned by solid demand projections and technically feasible capacity additions, and project preparation and appraisal may escape the scrutiny of other government agencies.

Table 3.4 Sectoral distribution of noncommercial lending by the DBM, 2018

Sector	Total DBM lending in MNT billion	% of total
Infrastructure	2,399	
- Construction and Urban Development	171	
- Road and Transport Development	1,344	
- Ub City	302	
- Energy	582	
Other economic sectors	19	
- Food, Agriculture and Light Industry	8	
- Mining, Heavy Industry	11	
Social sectors	2	
- Education, Culture, Science and Sport	2	
Other ministries	108	
Total	2,528	100%

Source: MOF, World Bank staff estimates

As part of their Economic Recovery Package, the IMF, the World Bank, and other international financial institutions called for improvements in the corporate governance and management of fiscal risks of the DBM given identified weaknesses in corporate governance, credit screening, and internal control during 2012–17. In 2017, the Law on the Development Bank of Mongolia was advised to strengthen its independence and reposition it to focus on commercial activities, restricting its participation in public investment projects. Nevertheless, asset quality remains a major concern, primarily because of legacy loans extended in the period up to 2017 (IMF 2019).

3.2.1.4 Sovereign bonds

Mongolia’s ability to issue sovereign bonds is likely to be constrained in the near term. Mongolia has issued a total of \$5.7 billion worth of bond (six sovereign bonds and two sovereign guaranteed bonds) on the international market since 2012. The interest rate on these bonds ranged from 1.52 percent to 10.875 percent,

with the maturity ranging from 3 to 10 years (Table 3.5). The main issuer of the sovereign-guaranteed bond was the DBM, which used the proceeds to fund many nonproductive assets, precipitating Mongolia’s deteriorating macroeconomic position.

Improper use of the bond proceeds, coupled with large currency depreciation, created a situation in which Mongolia faced the possibility of defaulting on its external borrowings. To help restore debt sustainability, the IMF and other multilateral and bilateral donors created a \$5.5 billion financing package to provide financial support and refinance some of the maturing debt obligations under the Extended Fund Facility Program to run between 2017–22. Against the backdrop of this program, a \$580 million sovereign guaranteed bond issued by the DBM as well as a \$500 million Chinggis Bond and a \$161 million Dim Sum Bond were refinanced under the Economic Recovery Program in 2017 and 2018, respectively. Mongolia’s ability to issue additional bonds is currently limited by its commitment to reduce its debt: GDP ratio.

Table 3.5 Overview of Mongolia’s sovereign and sovereign-guaranteed bonds

<i>Instrument</i>	<i>Title</i>	<i>Amount</i>	<i>Interest rate (percent)</i>	<i>Year issued</i>	<i>Maturity year</i>	<i>Remarks</i>
Sovereign Bonds	Chinggis-Tranche 1	\$500 million	4.125	2012	2018	Repaid by Gerege bond
	Chinggis-Tranche 2	\$1,500 million	5.125	2012	2022	Financed infrastructure projects and 888 projects for import substitution and promotion
	Dim Sum	CNY1,000 million	7.5	2015	2018	Repaid by Gerege bond
	Mazaalai	\$500 million	10.875	2016	2021	Refinanced by Gerege bond
	Gerege	\$800 million	5.625	2017	2023	Repaid matured Chinggis bond and Dim Sum bond
	Khuraldai	\$600 million	8.75	2017	2024	
Sovereign-Guaranteed Bonds	DBM euro	\$580 million	5.75	2012	2023	Refinanced by Khuraldai bond
	Samurai	JPY30 billion	1.52	2014	2023	
	TDBM bond	\$500 million	9.375	2015	2020	

The macroeconomic instability experienced by Mongolia over the past several years is a strong deterrent to private investors. The experience with the DBM and the issued sovereign bonds will affect Mongolia's credit and political risk ratings and may hamper private investor interest in future issuances. Currency fluctuations also have a direct impact on private investments in which revenues may be in local currency but contracts or financing in hard currency. With the assistance of the Economic Recovery Program, Mongolia has made significant progress in stabilizing its macroeconomic indicators. Although it now faces new challenges because of the worldwide impact of COVID-19, continuing to maintain prudent economic practices will help it attract more private investment in the future.

3.2.2 Possible Sources of Funding and Financing

3.2.2.1 User fees

Infrastructure projects can be funded through user fees, which create a revenue stream that may be attractive to the private sector. Mongolia has had experience with user-pays infrastructure in transport (roads, rail) and energy. In energy, tariffs below cost-recovery levels compromise the financial sustainability of the sector and constrain the ability to attract commercial financing and private sector participation. End-user tariffs cover only the short-run marginal cost of electricity. Eliminating cost distortions could lead to a 25–30 percent increase in the electricity tariff and a tripling of the heating tariff.⁴⁴ The electricity sector is cross-subsidizing the heating sector. Electricity tariffs have been adjusted upward several times to cover shortfalls in required revenues from district heating tariffs, which the tariff-setting authorities have decided to keep low. In addition, direct and indirect subsidies for

coal production and transport keep the domestic price of coal lower than the international price, benefitting state-owned thermal power plants and disincentivizing investments in other generation technologies.

Raising the tariffs to cost-recovery levels and improve the financial health of the energy sector in the short and medium term remains a priority. Below-average electricity prices are the result of the existing tariff regulation methodology, which does not ensure full cost recovery. A major issue is insufficient recovery of capex. Removing regulatory barriers for a financially and environmentally sustainable power sector development is key to interrupting the vicious cycle that has kept the sector cash starved and unable to finance needed asset upgrades. The main sources of cost distortions that lead to subsidies should be eliminated.⁴⁵ For overall financial sustainability of the sector, a more comprehensive reform of the tariff-setting methodology is required. It is necessary to shift from a backward-looking cost-plus regime toward a performance-based regulation, forward-looking regime. The first step should be to reduce the cost recovery gap through efficiency gains—by, for example, bringing in private investors. Public service obligation elements need to be considered, including the affordability of vital energy services for the most vulnerable segments of the population. International experience in this field—including studies funded by the World Bank's Energy Sector Management Assistance Program (ESMAP)—could be useful for Mongolia as it contemplates a strategy for tariff reform.⁴⁶

The main challenge for the government is determining how to best leverage its limited borrowing capacity and revenues to crowd in private sector investment. For government revenues to be sufficient to support infrastructure development in a meaningful way, they need to

⁴⁴ Internal working paper on tariffs, World Bank 2018

⁴⁵ These sources are (a) considering or not considering the asset base in the tariff calculation (b) the explicit cross-subsidy from electricity to heating, and (c) the subsidized coal price and transport paid by the generation companies.

⁴⁶ Two examples relevant for Mongolia are ESMAP Brief, 2017, Energy Subsidy Reform Facility Country Brief: Ukraine and ESMAP Brief, 2018, Energy Subsidy Reform Facility Country Profile: Kyrgyz Republic.

be increased, by encouraging increased private investment and improving revenue structures and collection. One way to leverage the private sector is through the use of guarantees, potentially through a DFI to increase the credit rating of the instrument.

3.2.2.2 Leveraging of mining assets

Mongolia's mineral wealth has long been considered its major asset and the likely source of revenue that could put the country on a more diversified and sustainable path. Despite accounting for 80 percent of export revenues and a quarter of GDP, however, mining contributes only 20 percent on average to domestic government revenues. The contribution is low because the largest mining projects are still undertaking substantial investment programs (underground construction by OT and expansion and related rail and power projects by Tavan Tolgoi). Taxes on profits will be subdued until investments are recovered. Other factors accounting for the sector's small contribution to government revenues include (a) low profit margins by operating mines, which face high infrastructure and logistics costs, especially for bulk minerals like coal and iron ore, and (b) excessive reliance on poorly designed tax concessions to promote mining investments and weak collection and audit capacity.

The World Bank's Country Economic Memorandum observes that on a cumulative basis, compared with revenue received by government from the mining sector, net savings have been negligible.⁴⁷ Revenues have been used either for immediate consumption or for investment. A significant allocation of public finances has been invested in mining projects and associated infrastructure. This allocation reflects the legacy of state ownership in mining and a policy introduced in 2007 mandating public investment in new projects to develop strategic mineral deposits.

Although state equity in mining promises a share of mineral resource rents for the benefit of the country, such investment is subject to the same level of risk and uncertainty that any investor in the sector faces. Risks are highest early on, when large capital investments have to be made; returns materialize only much later. If an investor has low financing costs and a tolerance for a long payback period, perhaps hedged by a wide portfolio of projects at different stages of maturity, mining can be a worthwhile investment. If the investor does not, mining can turn out to be a very poor way to use scarce financial resources.

Although Erdenes Mongol carries a large volume of liabilities and only some subsidiaries have begun to make profits, the government has mandated it to finance \$7–\$8 billion of additional investments in the next few years. Given liquidity constraints, Erdenes Mongol's investment requirements have been financed mainly by borrowing, either directly from banks or through the proceeds of government bond issues. Attempts to raise funds by selling a minority equity interest, as in the case of IPOs planned for Erdenes Tavan Tolgoi JSC, have been unsuccessful.

The government should reassess whether mandating state equity in mining is an optimal use of scarce public financial resources. Mongolia has yet to see sufficient returns on its equity investments in mining to have justified giving priority to the sector over alternative uses of public funds, such as on human development and public infrastructure. Indeed, new investment sanctioned by the government, such as for further expansion of Tavan Tolgoi, the new capital program at Erdenet and railroads for coal export (not all of these are unconditional), before profits have been realized on existing investments, suggest that the state may continue to be saddled with heavy financial liabilities at a time when fiscal space is already very constrained.

⁴⁷ Country Economic Memorandum 2020 (forthcoming), World Bank.

Any reassessment of the policy will have to consider alternative models for developing the mining sector that are less reliant on public funding. Previous governments have tried a variety of approaches to gain access to private capital through global capital markets and by offering concessions to private investors, including planned IPOs. Several attempts to develop part of the Tavan Tolgoi coal complex in joint ventures with private consortia were suspended. In relation to mining-related infrastructure, the record of concessions issued to private entities to build road and rail on a BOT basis has been mixed, with several concessions cancelled. Close evaluation of why such approaches faced challenges and how the mobilization of private capital could be approached in the future would be beneficial.

Relying more on the private sector and less on the public sector to develop Mongolia's mineral wealth would free up a significant amount of public funds to use on public infrastructure to support diversification of the economy. To the extent that there is public infrastructure

that would benefit mining as well as other parts of the economy, public resources spent on infrastructure could lower mining costs and increase mining profits and associated royalty and income tax payments, and the infrastructure could still earn a reasonable rate of financial return from user fees. There is also potential for privately financed mining projects to contribute to financing shared infrastructure that is open to multiple uses and users, based on the avoided cost of building dedicated infrastructure. The World Bank can mobilize funding and expertise to support the government in reassessing the State Equity Policy and examining a range of options open to it to better prioritize the use of scarce public financial resources and mobilize private capital.

Mongolia had hoped to be able not only to capture resource rents sufficient to contribute to its consumption and investment needs but to build net savings in a suitable form of sovereign wealth fund, as some other resource-rich countries have done. To date, little in the way of net savings has been retained after other needs

Box 3.2 State equity in strategic mineral deposits

Decree 27, issued in 2007, provides for the National Assembly to approve strategic mineral deposits. They are defined as deposits that may have an impact on national security, affect economic and social development at the national and regional level, or potential produce more than 5 percent of GDP in a given year. The original list had 15 deposits and a reserve list of 39. To date, only one of the reserve deposits has been added to the original list.

Listed strategic mineral deposits are divided into those in which the State interest is at least 51 percent and those in which it is at least 34 percent. Several coal deposits in the Tavan Tolgoi complex qualify for a controlling interest, whereas OT qualifies for a minority interest.

Through its interest, the state is responsible for its pro rata share of all project costs, including cost overruns, and is entitled to a pro rata share of dividends.

All of the state's interests in strategic mineral deposits are held through Erdenes Mongol, a 100 percent state-owned holding company whose board is appointed by and accountable to the Cabinet; individual interests are held through subsidiaries. Erdenes Mongol may eventually consolidate all interests, including legacy interests, such as in Erdenet JSC and Darkhan Metallurgical Complex JSC, both of which are 100 percent state owned.

In 2014, the Mining Law was amended to provide an option for a royalty payment to be received in lieu of exercising the right to take an equity interest in strategic mineral deposits.

Investments made by the state in strategic deposits are not limited to the mines themselves but may include investments in infrastructure that serve mines, such as road, rail, and power.

have been met, however. Mongolia developed 28 special funds, many of which were used for cash transfers rather than capital investments or savings. Three of them included the following:

- The Human Development Fund was established as a way of channeling mining sector revenues toward human development investments. Its weak record led The government to abandon its use in favor of alternatives. In practice, the fund built up liabilities through obligations to finance citizen cash payments pledged by successive governments. The government relied on its equity interest through Erdenes Mongol to finance these obligations from surplus cash generated by mining projects in its portfolio. However, any cash generated by such projects was needed to meet ongoing liabilities of the mining companies and support their capital programs, leaving no surplus for distribution. At one point, ETT, an Erdenes Mongol subsidiary, went to the market to obtain expensive short-term bridging finance so that it could continue to meet its business liabilities, including financing the citizen cash payments.
- The Fiscal Stabilization Fund (FSF) was established in the wake of the 2008 financial crisis and a rescue package from the IMF. It aimed to accumulate surpluses during mining booms and maintain them as a “rainy day” fund to dampen the effects of any downturn in mining revenues. The FSF accumulated some funds during the rapid recovery from the previous financial crisis but not on a scale that would significantly dampen the recurrence of a financial crisis such as that now induced by COVID-19. Coupled with the FSF is the Heritage Fund, which is designed to hold funds that exceed a specified threshold in the FSF, which can be treated as a store of wealth for future generations. At some point, if mining sector revenues grow substantially the Heritage Fund could serve as a useful vehicle through which targeted infrastructure spending could take place.
- Through the State Equity Policy, Erdenes Mongol receives mining revenue and allocates them in accordance with Cabinet directions. In 2019, proposals were made for Erdenes Mongol to serve as the vehicle through which all strategic public investments, including critical infrastructure unconnected with mining, would be financed. However, combining the role of holding the mining asset base from which revenues are generated with responsibility for selecting and financing strategic investments did not secure a sufficient consensus to go forward. As noted above, Erdenes Mongol’s liabilities to both creditors and domestic private shareholders means it is unlikely to be a source of significant financing for infrastructure in the near term.

Under the right conditions, investors in mining and mineral-processing projects will finance infrastructure that has wider public use, in the form of direct investment or through capacity and user charges. The mining sector thus has the potential to anchor large power and transport infrastructure investments that might otherwise be hard to finance purely by relying on public funds or smaller, less credible off-takers and users. One criticism levelled at infrastructure projects that are intended primarily to serve the needs of mines is that the cost of access to third parties is prohibitive, adversely affecting smaller mine operators and non-mining users alike. However, in principle, a government can adopt suitable policies and regulatory tools to promote increased third-party access to infrastructure, limiting the extent to which asset owners can engage in predatory pricing of access.

3.2.2.3 Local banks

Mongolia’s credit market is dominated by commercial banks, which hold approximately 95 percent of total assets. Total assets of the banking industry reached approximately MNT33.05 trillion (\$11.6 billion) in 2018 (104 percent of

GDP), up 14.9 percent from the previous year (MNT4.3 trillion or \$1.5 billion), primarily as a result of an increase in equity and loans (Figure 3.6). As of April 2019, Mongolia had 13 banks, with 1,425 branches. Golomt Bank, Xacbank, the Trade and Development Bank of Mongolia, and Khan Bank form the group of “systemic banks,” holding almost 80 percent of all banking assets in Mongolia. In 2018, 48 percent of the total assets of the banking sector was loans, 21 percent was cash and cash equivalents, 18 percent was in central bank bills and government bonds, and the remaining 13 percent was other assets. Total outstanding loans in the banking center were equivalent to 56.3 percent of GDP in 2019.

Domestic commercial banks in Mongolia have not actively participated in project financing for infrastructure. Financing of infrastructure projects has been a challenge because of the undeveloped nature of the domestic financial sector, which is characterized by loans with high interest rates, short maturities, and high collateral requirements. The high current policy interest rate of the Bank of Mongolia of 11 percent in 2019 reduced the likelihood and convenience of having significant private investments. Currency exchange fluctuations, high inflation, and an unstable policy environment lead to high variation in the interest rates of MNT-denominated loans and increase the risk for borrowers (Figure 3.7).

Figure 3.7

Total assets of commercial banks in Mongolia, 2014-18

Source: Bank of Mongolia

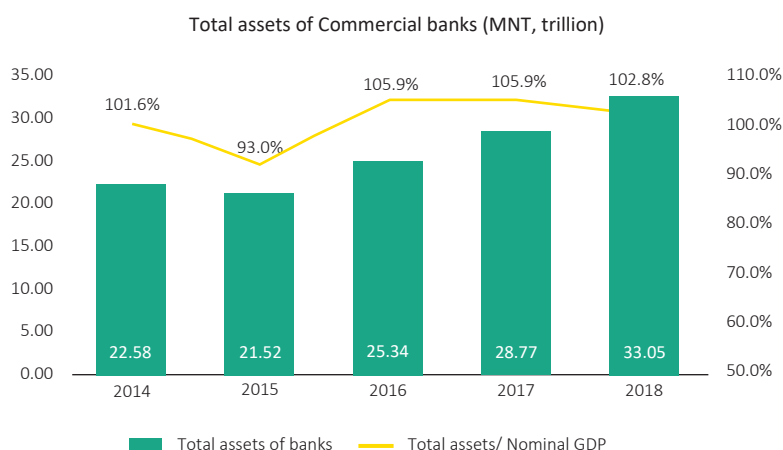
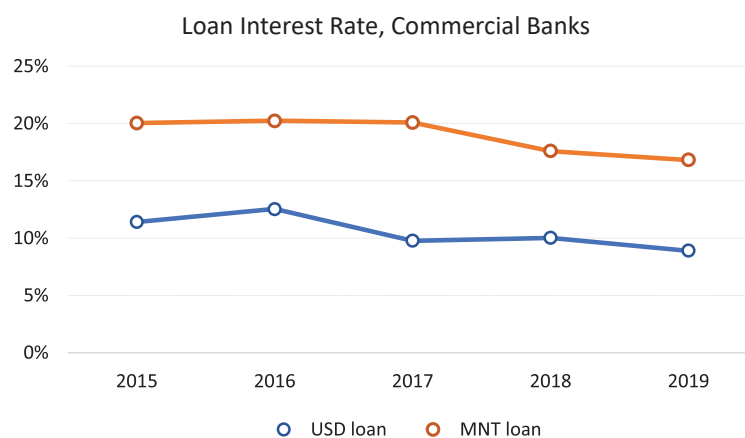


Figure 3.8

Interest rate on commercial loans in Mongolia, 2015-19

Source: National Statistics Office



Moreover, the amount of liquidity in local banks is not sufficient to finance infrastructure.

The total amount of outstanding loans reached MNT17.1 trillion (\$6 billion) in 2018, up 26.5 percent over the previous year. This growth was fueled mainly by the subsidized mortgage lending program. The total amount of loans issued to the private sector amounted to approximately \$3.8 billion (67.4 percent of total loans), which is sufficient to finance financing just one mega infrastructure project.

3.2.2.4 Capital markets

Long-term investment instruments remain limited in Mongolia, the pool of the retail and institutional investors is narrow, as a result of lack of competition in the capital markets, particularly in non-mining sectors. (World Bank, 2012) As a result, credits remain expensive and access to long-term investment for infrastructure projects is challenging. In 2018, the total market capitalization of joint stock companies stood at MNT2.5 trillion (\$876 million), up 2.9 percent over the previous year (Figure 3.8). The Top-20 Index in the Mongolian Stock Exchange was 20,076.5 as of December 2018, down 9.2 percent from the same period the previous year.

The Mongolian corporate bonds market does not play a role in long-term financing required for infrastructure projects. The Mongolian Stock Exchange trades common stock, government

bonds, and corporate bonds. However, the bond market is dominated by government bonds. Although corporate bonds can be more suitable than bank loans in financing infrastructure projects, as they have a longer-term maturity, they have not been used by companies to finance projects (Danaasuren, 2015). Moreover, Mongolia has no institutional investors (mutual funds, insurance companies, pension funds). Despite the current low-yield environment, international institutional investors have limited interest in infrastructure projects in emerging markets. They are yet to be comfortable taking greenfield construction risk and cannot wait years to generate a return on investment. They also lack the specialized skills or appetite to become deeply involved in project preparation and development at the individual project level. The most likely way that institutional investors will become involved is (a) in the securitization of operational assets with an existing revenue flow or (b) if certain infrastructure assets are packaged into a financial product that has been rated by rating agencies and is tradable in the capital markets.

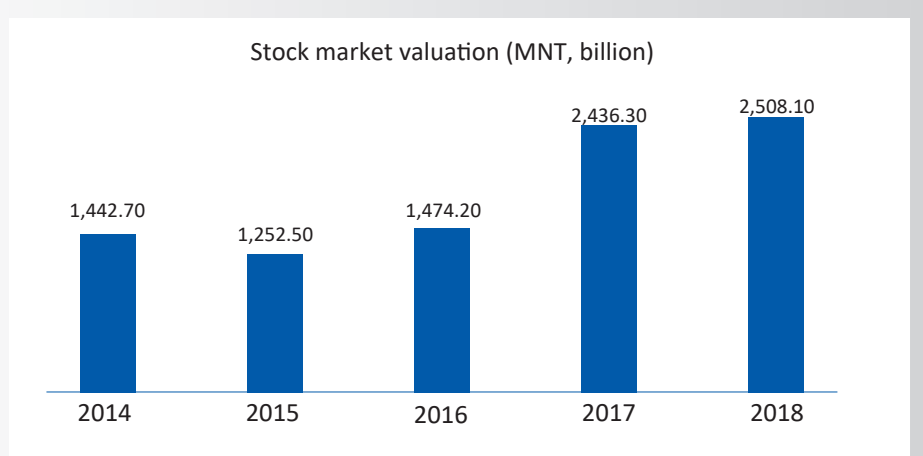
3.2.2.5 Improvement of the investment climate

Private financing of large projects is possible only if constraints for both foreign and local investors are addressed. In Mongolia, constraints for foreign investors include currency risk

Figure 3.9

Valuation of the Mongolians stock market, 2014-18

Source: National Statistics Office



(hedging is not usually available for the tugrik), the investment climate, the security package, political risk, and other risks. Constraints for local investors include lack of depth of the market, high interest rates, long tenors, and underdeveloped capital markets. Despite the openness of the Mongolian business environment to foreign investors, the investment climate has been undermined by several aspects of the political economy. As in many countries where economic performance depends on extractive industries prone to commodity cycles, one of the main challenges in Mongolia is political instability. The short lifespan of the government (2.5 years) leads to frequent changes in policy and regulatory regimes that hinder the transparency and stability of the governance. As a result, foreign investors are often forced to navigate through uncertainty in the Mongolian business regulatory environment. In addition, the periodical review of anti-corruption reforms by the Organization for Economic Co-operation and Development reports that corruption is widespread in Mongolia and there are serious shortcomings when it comes to preventing corruption in general and in public procurement in particular, both of which are serious hindrances to the efforts to increase and diversify FDI (OECD Anti-Corruption Network for Eastern Europe & Central Asia 2019).

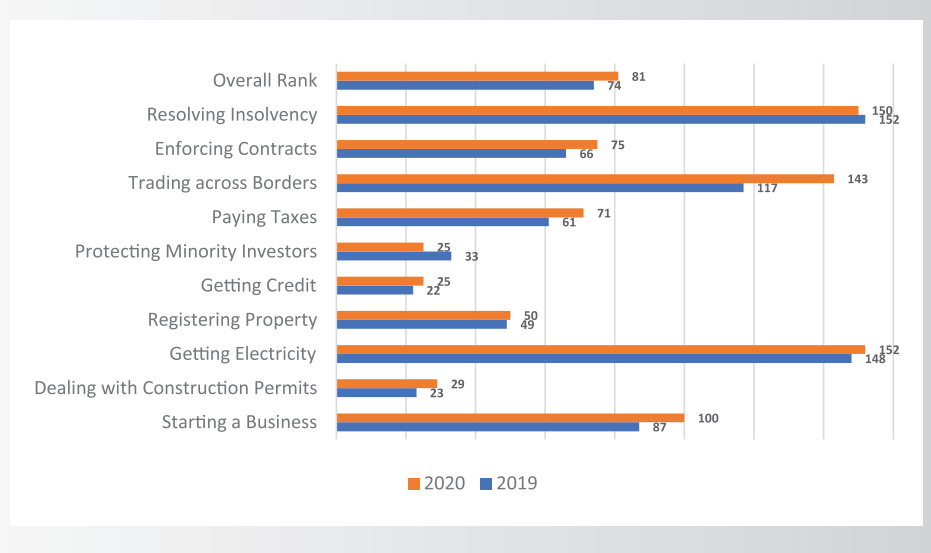
Geopolitically, Mongolia's landlocked position between China and Russia poses significant impediments to both trade and investments.

Trade with neighboring countries make up over 90 percent of Mongolia's total trade. Although the majority of investment flow comes from China, much of Mongolia's energy needs are met by Russia. This limits the ability of cross-border trade for Mongolia and poses significant political risk. Against the backdrop of these circumstances, successive governments have tried to reduce dependency and diversify trading and investment partners. The Economic Partnership Agreement with Japan and the Expanded Economic Partnership with the United States are two milestones in strengthening ties with other countries. Today, Mongolian exporters enjoy preferential access to some of the largest markets, including European Union, Switzerland, Norway, and Turkey, under the Generalized System of Preferences. Consistent and prolonged efforts to improve the investment environment and promotion are essential in improving the general investment climate.

Mongolia ranked 81st out of 190 countries in Doing Business 2020, down from 74th the preceding year (World Bank 2019). Mongolia ranks lower than its peer economies, and its performance is uneven (Figure 3.9). The

Figure 3.10

Mongolia's Doing Business rankings, 2019 and 2020



Source: World Bank

updated scores for 2019 highlight that there was improvement in protecting minority investors, but other indicators, including ease of paying taxes and trading across borders, fell. Obtaining credit had the highest performance, resolving insolvency had the lowest, reflecting the poor handling of issues surrounding insolvencies in the past (Figure 3.9).

In order to diversify the sources of funding for infrastructure development and increase foreign participation in infrastructure financing, the government needs to provide an open and conducive business environment, with a sound regulatory framework. One of the key pieces of legislation to protect investors' rights is the Investment Law of Mongolia, which provides a legal framework on the provision of tax stabilization, legislative protection, facilitation of repatriation of profits and strengthens arbitration rights. A survey on investor confidence (IFC 2019) revealed that the implementation of the legislation suffers from many shortcomings. Investors were distressed by the lack of regulatory transparency and arbitrary government actions. One of the significant actions the government has taken to improve investor sentiments was the set-up of the Investor Protection Council, which has resolved 12 cases of investor grievances before they escalated to full-fledged disputes (IFC, 2019). However, there have been four major investment-state disputes cases against the Mongolian government concerning the revocation of mining licenses and BIT contracts. One case was awarded against the government, resulting in an \$80 million settlement for indirect expropriation (IFC 2019). Several indexes, including the WNG Global Indicators of Regulatory Governance and the Global Investment Competitiveness Report, confirm growing concerns about political risk, government stability, and accountability.

IFC's *Investment Reform Map* recommended that Mongolia needs to maximize the inflow of FDI in the extractive industry to further diversify its economy and attract efficiency-seeking investment in the long run. The report revealed that there was no significant inflow of efficiency-seeking investments in processing or manufacturing sectors between 2012 and 2016. In addition to government support for these industries, IFC recommended that the legal framework for investment entry-requirements on foreign equity participation, ownership of real estate, and work visas-needs to be reviewed to ensure fair implementation of investment policy. Doing could be a major boost for investor confidence in the Mongolian business environment (IFC, 2019). The US State Department expressed similar concerns over foreign control and right to private ownership as well as protection of intellectual property (US Department of Commerce, 2017) as the state sees that lack of favorable legislative framework in these areas remain as the bottlenecks for US investors seeking business opportunities in Mongolia, mainly in the agriculture, renewable energy, and digital technology.

Guarantees and insurance products from development finance institutions could be used to help cover political and other government risks. For example, the World Bank offers a guarantee instrument that can cover government payment and other performance risk for private investors, allowing them to rely on the World Bank's credit rating instead of that of the governments. The Multilateral Investment Guarantee Agency (MIGA) offers a political risk insurance product that is fully market based. IFC may be willing to make equity and debt investments into projects alongside commercial banks, creating a "halo" effect. Such instruments can be leveraged to bring in the private sector and cover some of the risks described above.

Box 3.3 Renewable energy independent power producers

Some recent developments in relation to planned and existing renewable energy independent power producers (IPPs) will influence private investors in the energy sector. Renewable energy IPPs have so far been the only examples of privately financed power generation facilities that have actually been constructed. However, the experience so far has not been very encouraging for future investors. The process was poorly managed and lacked transparency, leading to oversubscription and unaffordable obligations for the grid operator, which in turn led to attempts to renegotiate contracts, uncertainties around power curtailment, and inadequate capacity to integrate new variable renewable energy (vRE) as well as the creditworthiness of the off-taker.

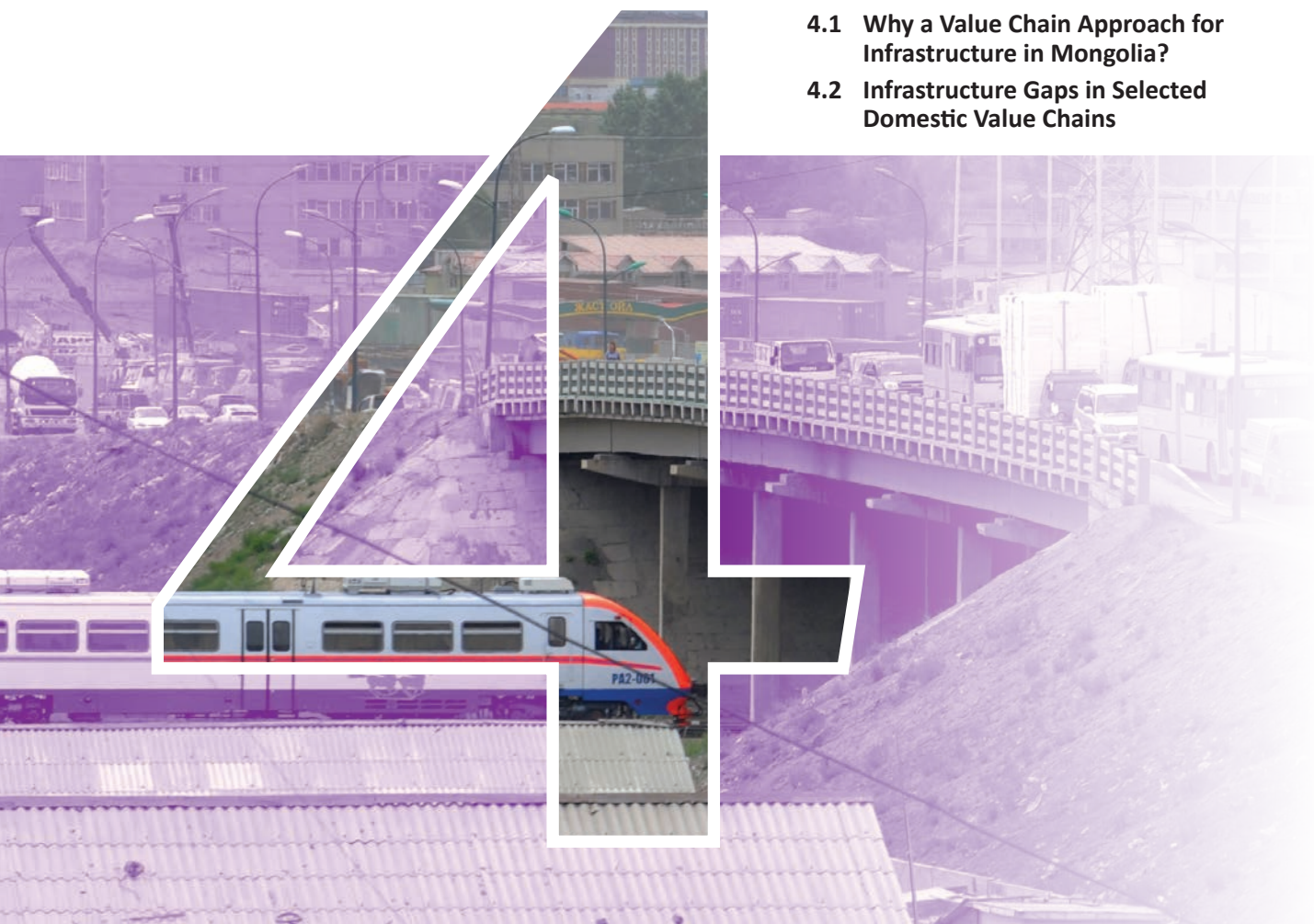
Specific issues included the following:

- A flawed process for licensing of renewable energy IPPs. Selection of projects was led by unsolicited proposals and direct negotiations, which contributed to unrestricted license approvals and capacity oversubscription. Permissions were granted based on informal proposals submitted to the Ministry of Energy, which then recommended that the wind and solar IPP proceed to power purchase agreement (PPA) negotiations with ERC [[AU: spell out]]. The absence of comprehensive technical due diligence before appraisal was the main reasons for this oversubscription. Not following a consistent planning framework and political interference contributed to the lack of transparency in granting licenses. As a result, 39 PPAs were signed between 2015 and 2017. Following a technical impact assessment conducted by the NDC in 2018 that demonstrated the limited capacity of the grid to integrate vRE, the majority of the IPPs were not allowed to proceed to construction. Some of them had secured financing and already incurred heavy outlays of funds for due diligence and development. Granting special permissions for new renewable energy project development has been suspended as well.
- Curtailment of operating vRE power plants and not honoring take-or-pay obligations. Because of the large share of CHP generation that must run to generate heat in the winter; the inflexible nature of the system, which cannot easily ramp up and down to follow the load; and the inability of the transmission network to absorb renewable electricity, renewable energy power generation has been curtailed. Such technical limitations have been exacerbated by the fact that there is no requirement for economic merit order of dispatch, so renewable energy plants with zero marginal cost are not necessarily dispatched first. Dispatch is guided by lower retail price; thermal power generation has therefore been dispatched at priority, leading to the perception by private investors that CHPs will be always favored in merit order of dispatch system over renewable energy plants. Such lack of transparency deters private investments in the sector.
- Inefficient operation of the single buyer model. The regulatory set-up and market model fails to incentivize market players toward efficiency improvements and is leading to noneconomic dispatch patterns. The model has many of the features of a single-buyer model, but there are concerns about its application. In principle, a zero-balance account has attractive features (certainty of payment and daily cash flow for generators), but significant negative balances are reducing payment certainty for generators, and disputes over the interpretation of payments required under PPAs exist. Every year, the single buyer operates at a loss. Vast arrears to renewable energy IPPs have accumulated as a result of the take-or-pay clauses of the contracts. The low creditworthiness of the off taker and the failure to honor contractual obligations have been serious concerns for IPPs. Uncertainty and inadequate revenues deter new investment and add to risk premium.

- Recent attempts to renegotiate PPAs with power plants in operation. In light of the substantially lower capital cost of solar and wind development and the unsustainably high PPA prices, payments to IPPs proved to be a vast financial burden to the off taker and created excessive contingent liability to the government. ERC undertook negotiations with the IPPs requesting their voluntary agreement to amend the terms of the contracts, including the addition of battery storage to optimize the operation of the plant or extension of the length of the contracts. Nevertheless, as the signed PPAs do not detail any situation that permits an amendment or termination under the contract, most IPPs did not agree to the new terms. Attempts to renegotiate a signed contract in which the investor and lenders have made significant upfront investments could affect investor confidence in the renewable energy market in Mongolia.

A Value Chain Approach to Assessing Infrastructure Investment Needs in Mongolia

- 4.1 Why a Value Chain Approach for Infrastructure in Mongolia?
- 4.2 Infrastructure Gaps in Selected Domestic Value Chains



4

A VALUE CHAIN APPROACH TO ASSESSING INFRASTRUCTURE INVESTMENT NEEDS IN MONGOLIA

4.1 Why a Value Chain Approach for Infrastructure in Mongolia?

No country has ever achieved long-term growth or poverty reduction without access to international markets. To increase the competitiveness of its exports, Mongolia needs a cost-effective way to transport goods over its vast territory. Investments and policy reforms that reduce trade costs through efficient logistics are critical. They were the driving factor behind the integration of East Asian countries into the global economy. The World Trade Organization (WTO) identifies (low) logistics cost as one of the key drivers of long-term growth in trade and commerce. A study of nine Latin American countries suggests that reducing transport cost by 10 percent leads to an increase of more than 10 percent in the value of products exported (Moreira and others 2008).

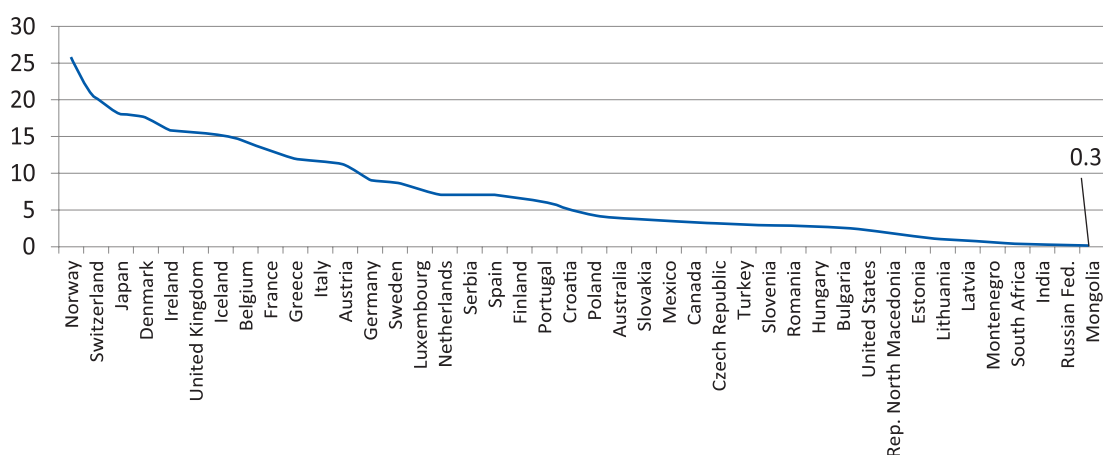
Achieving Mongolia's vision under the Sustainable Development Vision 2050 requires careful planning and cross-sectoral collaboration, underpinned by infrastructure development that is integrated and targeted. In order to stay within the parameters of the macroeconomic policy principles-achieving a zero overall budget deficit and strictly complying with debt-ceiling requirements-Mongolia will need

to prioritize development projects to optimize resource allocation and strengthen coordination among key stakeholders, particularly the National Development Agency (NDA); the Ministry of Finance; line ministries (the Ministry of Road and Transport, the Ministry of Agriculture and Light Industry, the Ministry of Mining and Heavy Industry, the Ministry of Energy, and the Ministry of Construction and Urban Development); and the private sector.

The current jurisdictional-based approach in planning infrastructure leads to inefficient allocation of resources, as evident from GDP per productivity per ton-kilometer in selected countries (Figure 4.1). The world uses 32 trillion ton-kilometers to produce \$80 trillion of GDP, a global average of \$2.30 per ton-kilometer. Mongolia gains only \$0.30 of GDP per ton-kilometer. To increase this figure, countries can either increase the value of goods being transported or enhance the efficiency of transport to reduce the transport cost relative to the economic contribution. Ideally, both methods are adopted to leverage economies of scale to bring down transport cost relative to the GDP. Efficiency can be optimized if the government takes a bottom-up approach to consider the supply and demand of commodities and the flow and the cost of transport.

Figure 4.1

GDP per ton-kilometer productivity in selected countries, 2018



4.2 Infrastructure Gaps in Selected Domestic Value Chains

Freight flows were modelled and then analyzed in the context of specific value chains, to develop the value chain approach for Mongolia.

Freight flows can be modelled based on freight surveys, vehicle counts (supply side), and freight modelling (demand side). Surveys lack the required granularity to accurately model national freight flows across all commodities. Vehicle counts can be accurate on a national scale but are severely limited with regard to the contents of the vehicles; they are also commodity blind and ambiguous, as the same vehicle can be counted multiple times. A hybrid approach is the most data intensive, but it delivers the richest outputs for understanding disaggregated flows by commodity, geography, and origin-destination flows across an economy.

A hybrid freight model was developed using national statistics and other data. Demographic data and agriculture crop and livestock data per *soum* were obtained from the National Statistics Office (NSO). In addition to national statistics, data inputs were obtained from publicly available data sources from nongovernmental organizations and third-party data providers. The data were processed into supply and demand for

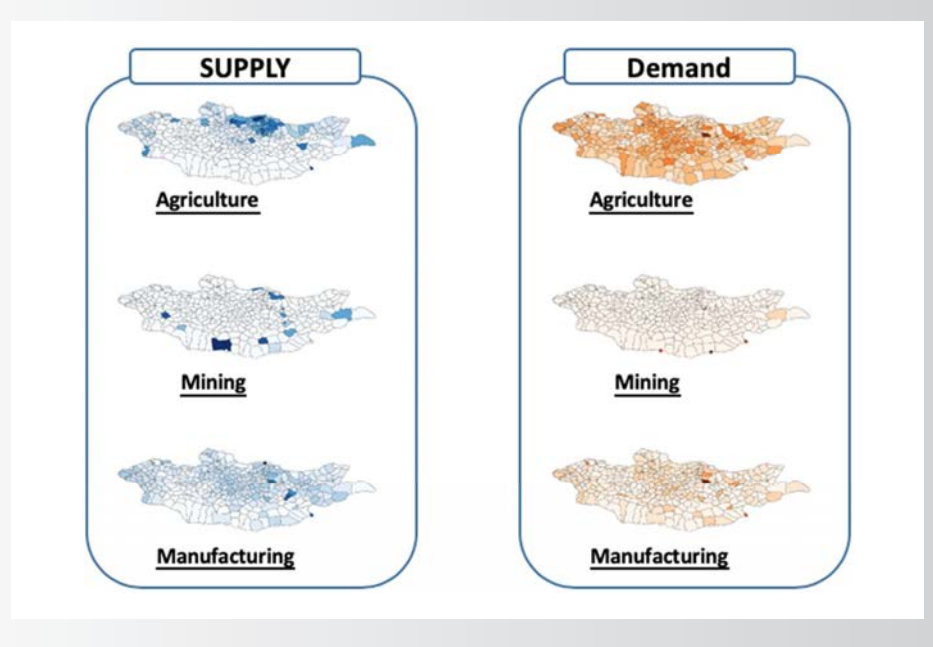
84 commodities across 339 *soums*, and provision was made for 10 border crossings. The output of the freight demand modelling is a large dataset of all freight flows at the *soum* level for every commodity.

The supply of and demand for commodities in Mongolia reveal the logistics challenges the country faces. The supply of agricultural commodities is concentrated in the north; demand is spread across the country (Figure 4.2). The supply of mining commodities is concentrated where thermal coal is used for power generation, chiefly in Ulaanbaatar, and at the border posts where minerals leave Mongolia for export markets. The manufacturing sector is concentrated within and around Ulaanbaatar and along the north-south corridor, although manufacturing activities are evident across the country.

The supply and demand were used to produce Origin-Destination flows which enable the use of a value chain approach. The freight flows are required to identify the infrastructure gaps currently impeding economic growth and diversification efforts. Infrastructure planning requires careful, evidence-based planning, which is subject to, but not limited to the design, financing, and management of said infrastructure.

Figure 4.2

Supply of and demand for agricultural, mining, and manufacturing commodities in Mongolia, 2018

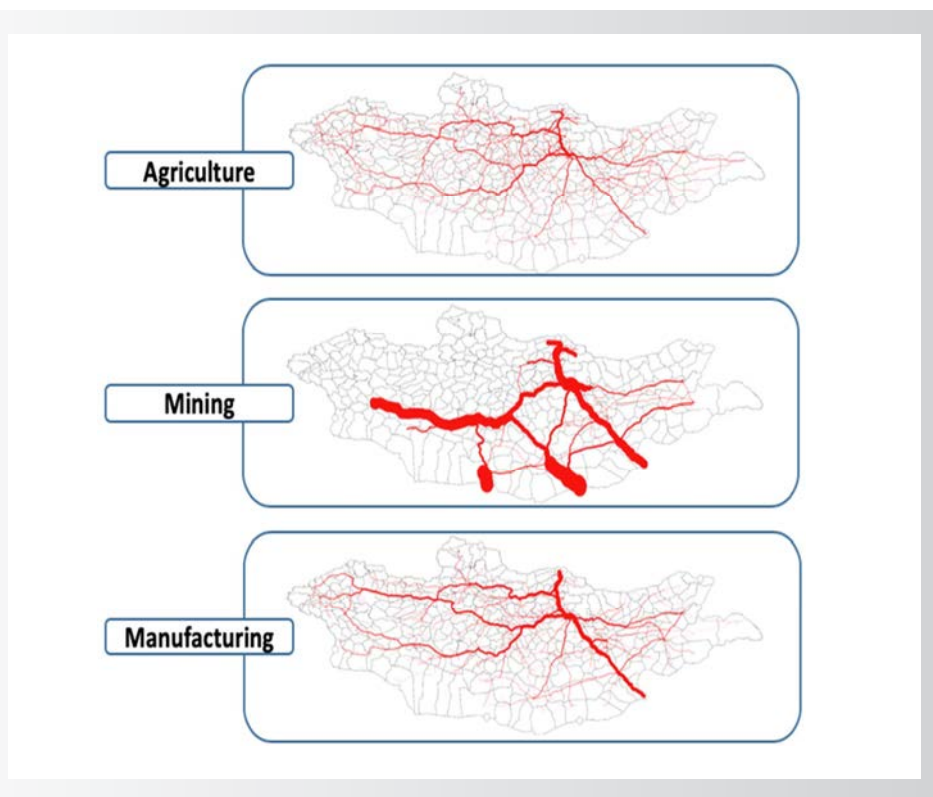


It needs to take account of all spatial elements, including flows and nodes of economic activity. Infrastructure investment when optimally inserted into a supply chain optimizes the supply chain's economic outcomes. Efficient

infrastructure investments should be made to complete value chains to enable continuous revenue streams. Figure 4.3 shows the freight flows for agricultural, mining, and manufacturing commodities.

Figure 4.3

Flows of agricultural, mining, and manufacturing sector commodities in Mongolia



The vastness of Mongolia makes transport costly. The average transport distance for freight movement in Mongolia is 602 kilometers. The total annual transport cost is estimated at \$2 billion and the logistics costs is estimated at \$3 billion. At 30 percent of GDP, logistics costs are high in Mongolia. In Uzbekistan, another landlocked country, they represent just 17 percent of GDP. High logistics costs also indicate Mongolia's vulnerability to exporting its mineral wealth. The economy has not been diversified to the point of industrial countries, such as China and the United States, where there is a large tertiary sector, which does not require any transport to deleverage its logistics cost as a percentage of GDP despite having large transport cost bills.

4.2.1 Infrastructure to Support Livestock Value Chains

The spatial challenges Mongolia faces are not insurmountable; other countries have found solutions. Namibia, for example, used auctions and transporters as a market mechanism to distribute livestock within the supply chain where necessary (Figure 4.4). In addition to organic meat, branded as Farm Assured Namibian (FAN) Meat, Namibia is able to earn more than three times more than Mongolia from meat exports, despite having about one-ninth as many livestock.

To address logistics and transport costs in Mongolia, freight flows need to be reconfigured around a supply chain that takes account of Mongolia's unique socioeconomic context. The proposed supply chain reconfiguration in Figure 4.5 would support the transition toward high productivity. At its core, it enables consolidation of animal health and processing services while retaining herder households as the cornerstone of meat industry based on additionality that would be minimally disruptive to the current status quo. Mobile abattoirs are used to reach multiple households, in order to reduce the required transport within the supply chain through consolidation of carcasses. Feedlots are used to increase the reliability of the livestock supply and to mitigate harsh winter conditions. This would also improve the general quality of herder households' livestock. Veterinary services are also provided, at what can be considered agro-processing freight villages (hubs), which also offers ancillary agricultural services required by the meat industry as well as cold storage to maintain the cold chain. The processed carcasses are then transported to a larger centralized freight village for further processing for export and domestic urban markets. The industry would benefit from the commercialization of animals that would have perished as a result of lack of appropriate infrastructure.

Figure 4.4

Meat supply chain in Namibia

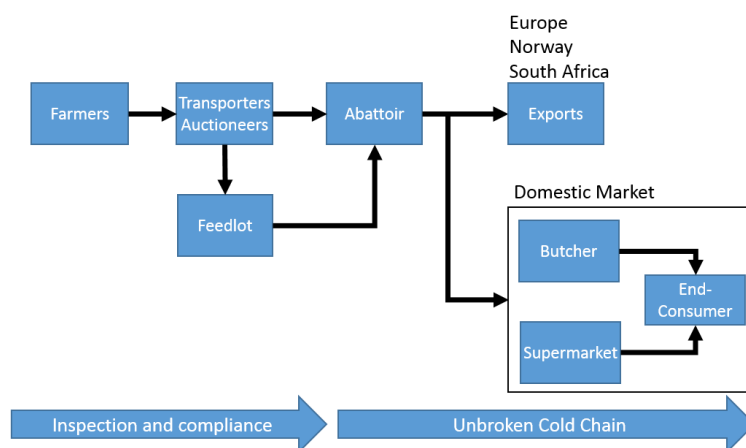
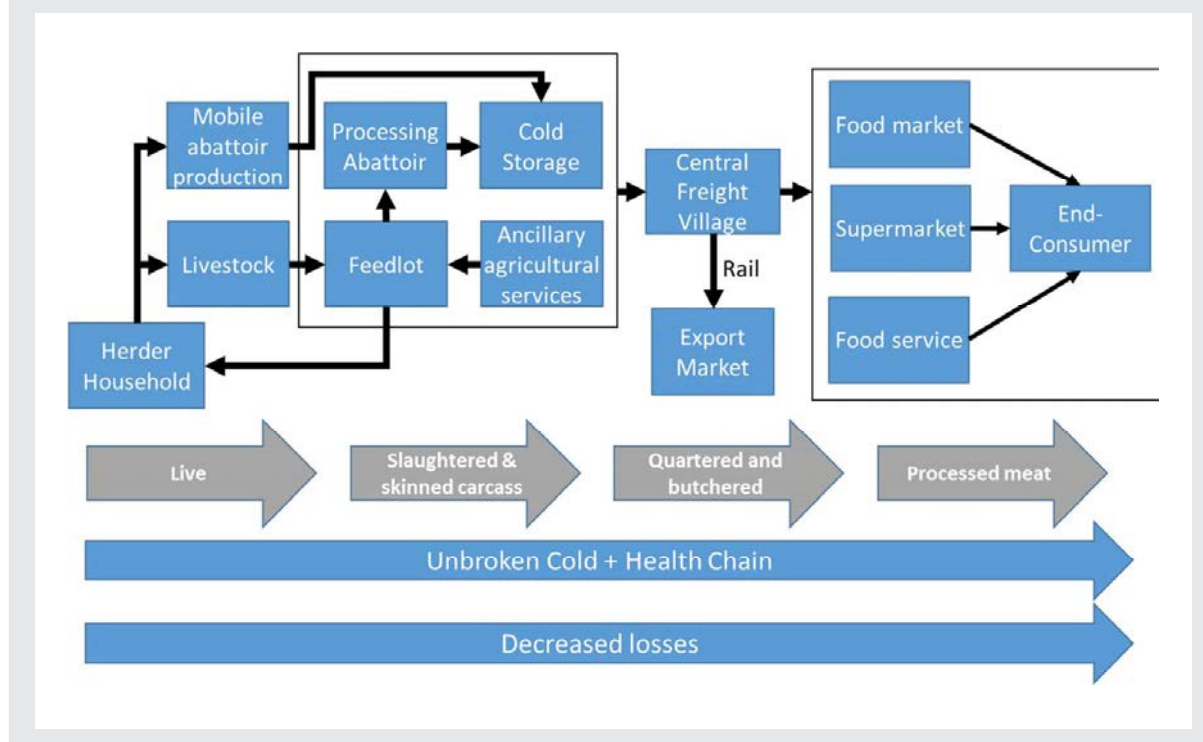


Figure 4.5

Reconfiguration of the Mongolian meat supply chain



Mongolia could unlock about \$800 million from meat exports by inserting appropriate infrastructure in the meat supply chain. Currently, the meat industry is hamstrung by the lack of control over its supply as well as by losses throughout the supply chain, which is characterized by poor animal health and the spoiling of carcasses. The insights from the freight flow model of the meat supply chain proposes eight locations for hubs that could be used to consolidate the meat supply chain: Uvs, Khovsgol, Bulgan, Arkhangai, Ovorkhangai Tuv, Khentii, and Sukhbaatar (Figure 4.6). This configuration a different from the status quo, where all slaughtered meat is taken to Ulaanbaatar and most of the value is lost before reaching the market.

The value chain was quantified with three topologies that estimate the transport cost for three different strategies: The eight hubs are supplied by the nearest surrounding *soums* through mobile abattoirs. Carcasses

from the mobile abattoirs are consolidated for optimal transport, either to the major hub in Bagakhangai, where the meat goes through final processing or to a secondary hub. Bagakhangai could conceivably become a “sustainable” city of Mongolia with highly advanced service and ICT sector (Box 4.1).

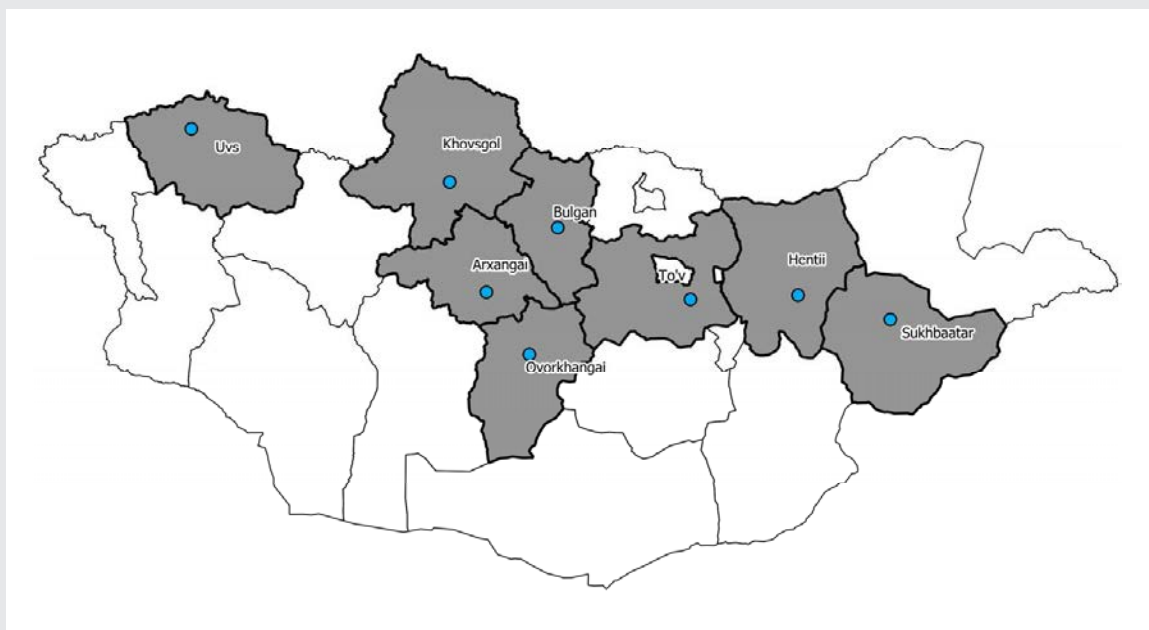
The processed meat could then be consolidated in refrigerated containers for export by rail. Alternatively, the meat could be processed at the hubs for a direct export to China. Table 4.1 contains the estimated transport cost for the different freight strategies.

Three scenarios of additional meat flows were costed (Figure 4.7):

- no consolidation: meat is exported directly from the eight hubs to China
- consolidation by road: meat is consolidated at Bagakhangai and exported by road
- consolidation by rail: meat is consolidated at Bagakhangai and exported by rail.

Figure 4.6

Locations of proposed agro-processing freight villages



Box 4.1

Proposed new sustainable city for Mongolia

Ulaanbaatar was initially designed for 500,000 people. As a result of the heavy migration from rural areas that accompanied economic growth since 2008, the city's infrastructure has been under significant strain.

The infrastructure required at the freight village at Bagakhangai could serve as the economic cornerstone around which a sustainable city could be developed to attract growth in the ICT and service sector. Bagakhangai has the potential to alleviate some of the strain within Ulaanbaatar, by attracting some of the rural migration. It is 88 kilometers from Ulaanbaatar and located on the Trans-Mongolian Railway, which makes it an ideal location, as it also avoids the congestion in and around Ulaanbaatar.

Table 4.1

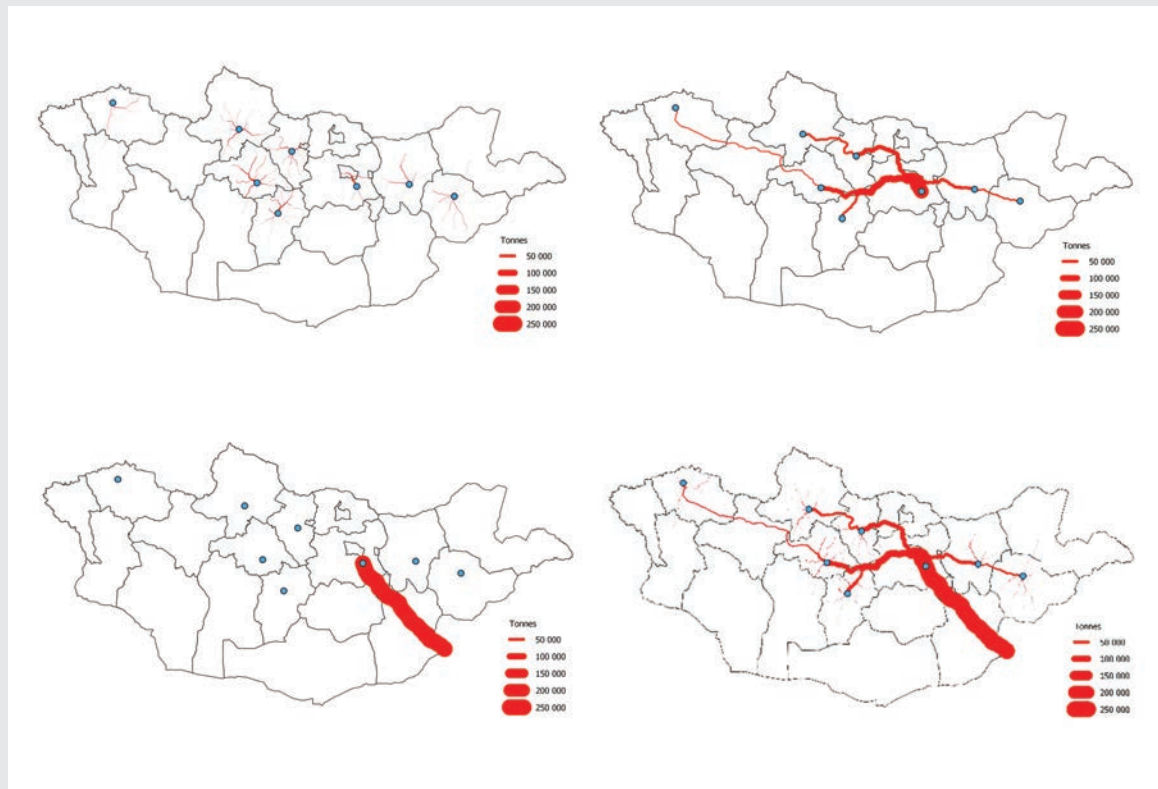
Estimated transport cost for additional meat freight flow scenarios

<i>Additionality flow typology</i>	<i>Million ton-kilometers</i>	<i>Million \$</i>	<i>Kilometers of good roads required</i>
<i>Soum to Aimag hubs</i>	32.0	3.5	n.a
<i>Hub to China (direct)</i>	289.8	17.4	3,999
<i>Aimag hubs to Bagakhangai</i>	159.2	9.6	2,954
<i>Bagakhangai to China (rail)</i>	161.9	3.0	n.a
<i>Bagakhangai to China (road)</i>	152.4	9.1	574
<i>Hub to Ulaanbaatar</i>	162.4	9.7	2,954

Note: Assumptions: Cost per ton-kilometer from soums to hubs: \$0.11; cost from hubs to Bagakhangai and Chinese border: \$0.06. Rail cost: \$0.02.

Figure 4.7

Typologies of additional meat-processing flows



The “no consolidation” scenario requires 4,000 kilometers of roads between the eight hubs and the border to be maintained adequately. It would result in an estimated transport cost of \$32 million. Consolidation at Bagakhangai with the export to China via road would require 3,528 kilometers of same quality roads. It would result in an estimated transport cost of \$22.2 million. If exports from the major hub at Bagakhangai are transported by rail, 2,954 kilometers of roads need to be maintained adequately between the hubs and Bagakhangai. The cost would be \$16.1 million (Figure 4.8).

Figure 4.9 provides an overview of the integrated supply chain. The physical infrastructure requirements at the top, their specifications are in the middle, and the soft infrastructure is at the bottom. At the heart of the proposal is establishment of a globally recognized certification system (for example,

UB1 meat), which would enable access to further regional export markets. This is conceptually similar to the Kimberley Process, a multilateral trade regime established in 2003 with the goal of preventing the flow of conflict diamonds. It uses the international Kimberley Process Certification System (KPCS), which certifies diamonds to be conflict free.

Creating a globally recognizable product would legitimize trade by ensuring that ethical standards and sustainable practices that protect both herder households and livestock are in place. Figure 4.9 illustrates the expected value add at each stage of the meat-processing value chain. The branded meat could be marketed as disease-free, organic, and free-range in addition to conforming to UB1 standards and practices.

Figure 4.8

Costs of three transport strategies for exporting meat from Mongolia

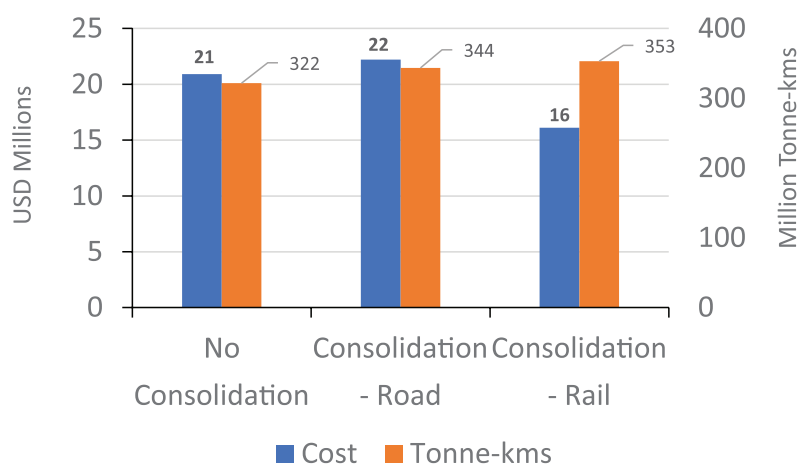
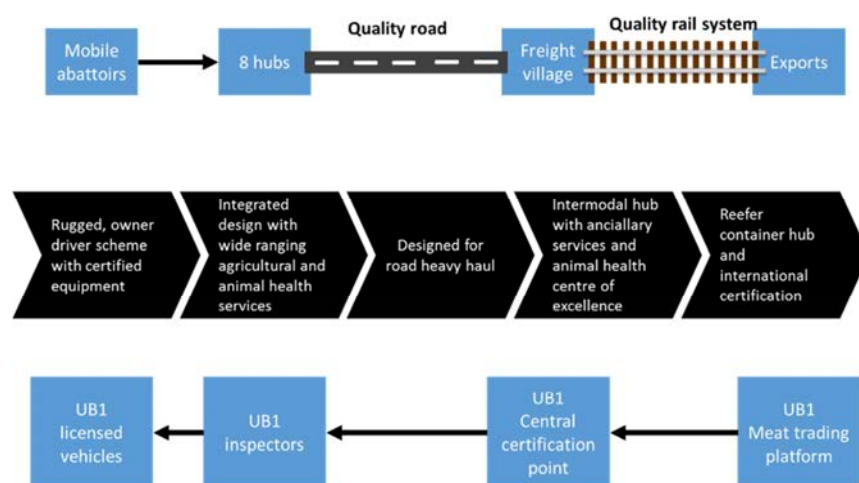


Figure 4.9

Supply chain design to facilitate value addition for meat



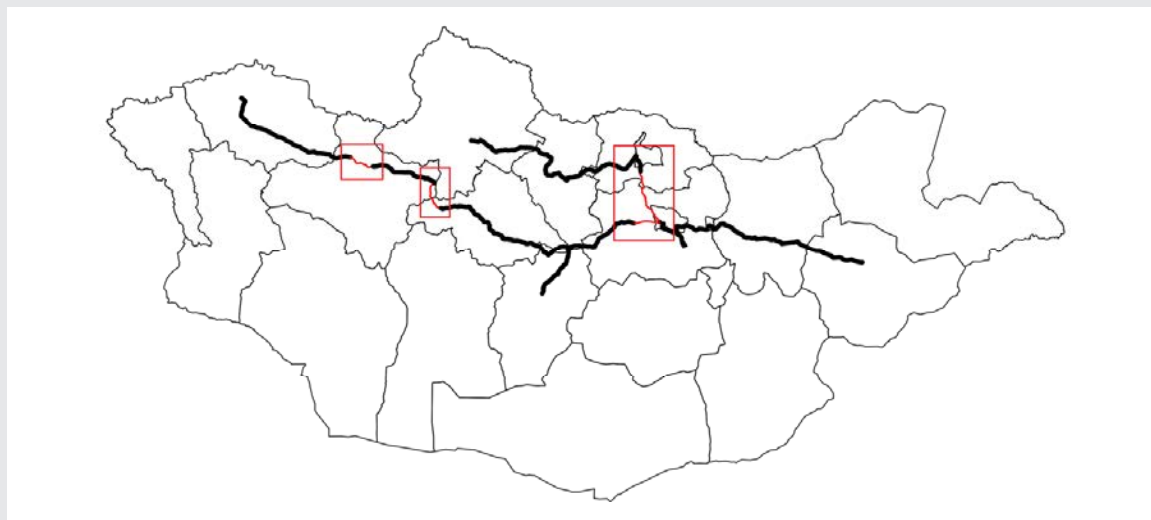
Targeted transport infrastructure investment is required to facilitate the agro-processing additionality supply chains. These supply chains are estimated to require 2,954 km of well-maintained roads and rail capacity on the North–South corridor from Bagakhangai to China to operate efficiently. Of the 2,954 km of roads required between hubs, 2,668 km are asphalt concrete. Of the asphalt roads 105 kilometers are

in a very good condition, 1,327 km are in a good condition, 1,084 km are in a fair condition, and 152 km are in a poor condition. The remaining required road consists of 104 kilometers of cement concrete, 13 km of gravel 12 km of graded earth, 128 km of ungraded earth road, and 24 kilometers of road that passes Ulaanbaatar to the south. The hubs could be connected to Bagakhangai as shown in Figure 4.10.⁴⁸

⁴⁸ Where the road inventory is less than the length of the road required between the hubs, it is assumed that there is no road infrastructure in place along those routes.

Figure 4.10

Required road infrastructure to facilitate meat additionality in Mongolia



Note - black lines are existing roads in good to fair condition. These will require maintenance but require minimal investments. The sections in red are roads in poor condition that will require major upgrades to provide for smooth connectivity.

For these value chains to effectively reach the Chinese market, sufficient capacity is required on the railway from Bagakhangai to Zamiin-Uud. The capacity upgrades referred to in the Trans-Mongolian Railway section of this report would be sufficient to enable effective export (Figure 4.13). Agricultural diversification would require 420,000 tons of additional capacity on the railway.

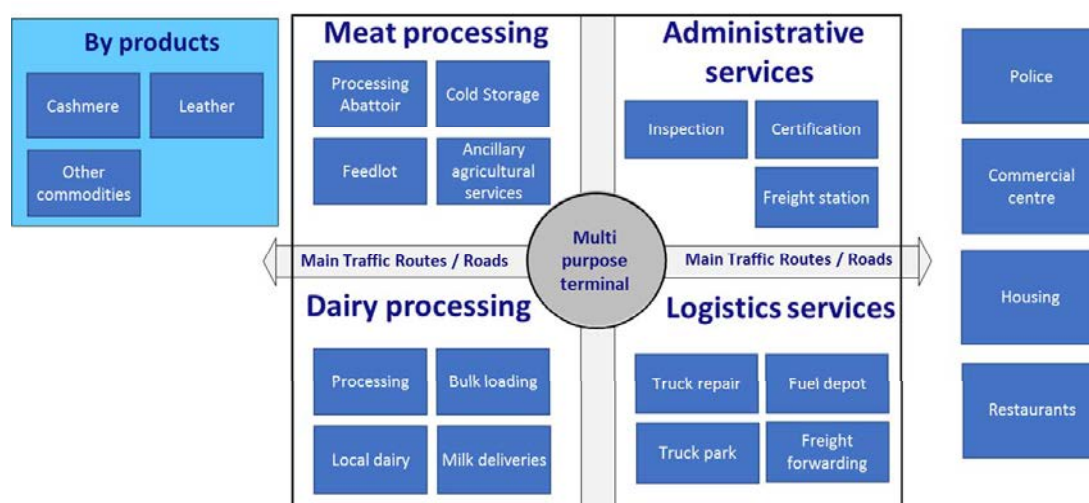
4.2.2 Infrastructure to Support the Milk Value Chain

The core transport infrastructure for the milk value chain is essentially the same as the infrastructure for meat. Establishment of eight 3,000-head dairy farms or equivalent milk-processing facilities would lead to an additional 160,600 tons of annual milk production which would leverage the same road infrastructure needed for meat value addition. Consolidation of herder households' dairy livestock would address the current value chain's shortcomings. Veterinary services would be available from the eight hubs, improving the health and breeding quality of the dairy livestock and increasing the yield per animal and income per household. Herder households that sell milk earn three

times the income of those who do not. If dairy farms cannot be established, because of lack of buy-in by herders, a solution similar to that of the mobile abattoirs would need to be designed to facilitate an unbroken cold chain. One option is a modular tanker design that combines ten 500-liter containers (picked up from 10 herders) into a 5-ton milk consignment to be picked up from herders and delivered to the hub. A fleet of 20 such vehicles would be needed per hub.

At the global average milk import price of \$0.77 per liter, milk exports of 160,600 tons to neighboring countries would generate \$120 million. China is still a net importer of milk and milk products. It imports 60 percent of the world's soya bean production to fuel its domestic milk market. Given Mongolia's strategic location, it could provide milk exports to China that could compete with China's largest milk trading partners (New Zealand, Germany, and Australia).

Freight villages are critical to the consolidation of the agro-processing supply chains for meat, hides, leather, and milk. Consolidation along freight routes of different value chains could drive logistics costs down. The consolidation of nodes into higher-order logistics hubs could have the same effect on multiple value chains.

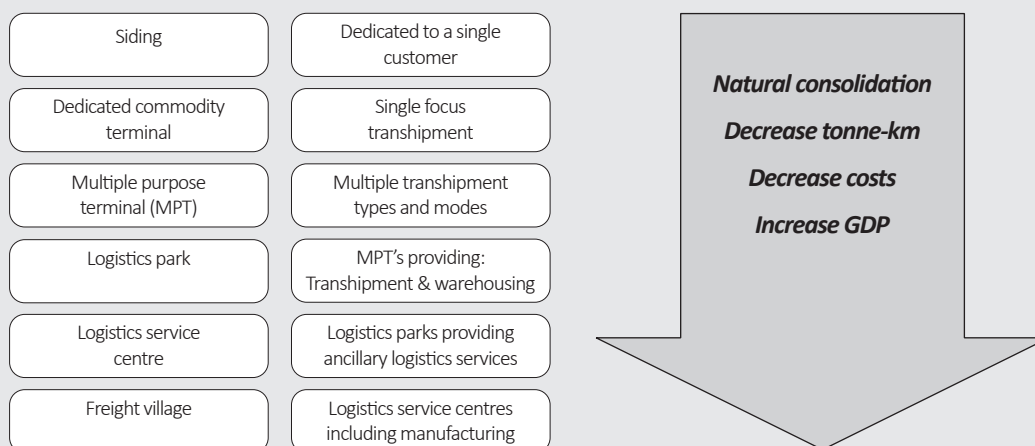
Figure 4.11 Typical design for livestock-oriented hub

The consolidation task is typically assigned to logistics service providers and consolidators. However, without logistics hubs with appropriate configuration (for example, logistics parks or freight villages), consolidation cannot be fully

implemented. Figure 4.12 shows a typical design for a livestock-orientated hub. In the developing world, freight consolidation is possible only if the infrastructure and supportive policies are facilitated (Box 4.2) (Havenga, 2020).

Box 4.2 Overview of the macroeconomic supply chain

One of the most important components of the macroeconomic supply chain is the underlying infrastructure, which includes transport infrastructure (such as roads, rail rolling stock and permanent way, and port berths and cranes) and warehouses. [AU: It seems late in the report to explain what transport infrastructure is] These hubs can range from a single-function terminal to a freight village with extended logistics facilities associated with it (box figure 4.2.1)

Box figure 4.2.1 Components of the macroeconomic supply chain

4.2.3 Infrastructure to Support Mineral Value Chains

There has been limited progress in adding value to Mongolia's minerals. This includes value addition through beneficiation at mine sites and further downstream processing of minerals. Challenges have been largely but not exclusively caused by lack of access to reliable transport and power infrastructure (as well as to water). Many studies have identified opportunities and plans to overcome these challenges. But in the decade that has passed since mineral production volumes accelerated on the back of the Chinese-led mineral trade, very few challenges have been overcome. Only 15 percent of Mongolia's leading export product, coal, is transported by rail, relying instead on roads, which has led to congestion, lost time, and high costs (Figure 4.12). Only 44 percent of mining and heavy industry consumption of power in 2019 was supplied by the grid, with self-supply reliant either on diesel generation or in the case of Oyu Tolgoi (OT), the second-largest

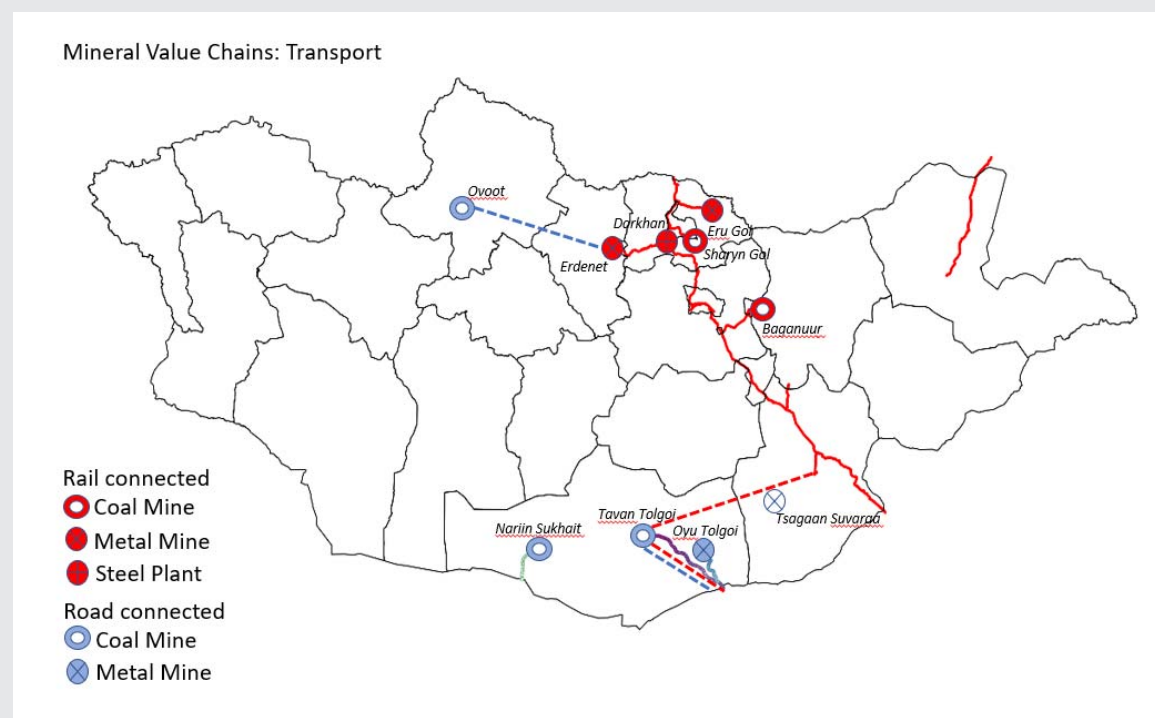
mine consumer of power, on imports from China. Even among mines connected to the Mongolian grid, back-up generation is often needed to ensure uninterrupted supply.

4.2.3.1 Transport

Early planning of railways to export coal was predicated on expectations that Mongolia would export over 50 million tons of coal to China by 2020 and up to 100 million tons by 2030. Construction of two of the long-planned railways running south and northeast from the Tavan Tolgoi coal complex was launched in 2019. If full construction can be financed, they would come into operation in 2021, according to ETT, at a combined cost of \$2.27 billion. The railways would be able to carry 50 million tpy of coal. Now that the initial public offering (IPO) of 30 percent of the shares of ETT has been called off, the onus falls back on the government to find funds to supplement whatever internally generated cash ETT can commit to these projects.

Figure 4.12

Mongolia's mineral value chains and transport infrastructure gap



Source: World Bank.

Mineral processing undertaken at mine sites can benefit from the same road and rail infrastructure available to transport unprocessed minerals.

Other things equal, the reduced volume of mineral products needing to be transported because of on-site processing would ease pressure on freight-handling capacity. If mineral processing is carried out not at the mine site but at another location in Mongolia, the cost of transporting relatively bulky mineral ore, has an impact on the viability of the location selected. To reduce transportation costs, processing is best carried out closer to the primary mine. Generally, the justification for not processing minerals at the mine site is that another site is closer to buyers, has better access to raw materials, and/or better availability of reliable supplies of power and water. For example, evaluations of developing the iron ore to steel product value chain rely on iron ore being upgraded at the mine site but then being transported to the steel mill at Darkhan where the significant value addition takes place and power, water and coking coal is supplied reliably. Several iron ore mine owners have invested in sealing roads or building spur lines and rail loading facilities, although to this point the steel mill project at Darkhan is stalled and producers are using the same transport infrastructure to export iron ore to China instead. This experience illustrates the need for coordination and planning across the value chain to minimize costs and improve viability of mining undertakings. As is the case if livestock value chains, consolidation is critical obtain economies of scale.

A shift from road to rail haulage for coal is long overdue and would generate transport cost savings and reduce ecological damage. But there are mounting challenges to finance coal infrastructure, especially after cancelling of the ETT IPO. Rail investments for coal exports should proceed only based on a full life-of-asset cost-benefit assessment that considers system-wide benefits from interconnections, cost-effective supply of minerals for domestic processing and opportunities for multiple uses and users. Moreover, appropriate weight should be

assigned to stranded asset risk. This is more of a concern for thermal coal at present since demand for Mongolian coking coal is likely to remain firm in China in this decade. The prospects thereafter are less certain as demand for coal-reliant steel-making reaches a plateau.

For transportation of minerals located farther from the border with China, the optimal route to use to reach the Chinese (or Russian) markets has been the Trans-Mongolian Railway. Erdenet uses it for its copper concentrates; several iron ore mines in the north near Darkhan use spur lines built to railheads on the main railway. Some others, such as Tsairt's zinc mine in the Sukhbataar area, rely on road haulage to reach the railway. The capacity and operational limitations of the rail line affect the cost to deliver minerals to buyers. Improving its service would have beneficial impacts that would extend to a wider set of users than just mineral exporters. In a scenario in which setting up of steel and copper plants proceed at locations along the rail corridor, and assuming that the rail link from the coal complex at Tavan Tolgoi to Zuunbayan is completed to enable coal and copper concentrate supplies to reach these plant, the increased burden on the Trans-Mongolian Railway would necessitate additional capacity, especially double tracking. The 226-kilometer section of railway track between Sainshand and the Zamiin-Uud/Erenhot border with China would experience the highest increase in traffic density mineral products such as direct reduction iron (DRI), refined copper, and coking coal flow to that border crossing. The break-of-gauge transloading facility at the Zamiin-Uud/Erenhot border would have to be expanded to handle 6,000 tons of bulk minerals train parcels. Planning such railway investments would require a high degree of coordination to ensure an optimal solution.

The valid concern around constructing a DRI plant at Darkhan is the lack of iron ore to sustain a 20-year production horizon. Government reports that there is 1.2 billion tons of proven iron ore reserves would mean that if the planned DRI expansion at Darkhan is built, minable iron

ore reserves would need to be developed to feed the plant. Depending on the location of the iron ore mines that would provide feedstock for Darkhan, it would require a dedicated transport solution. Whether the optimal solution is a road or rail remains uncertain until a location is determined. However, the cost of the transport infrastructure needs to be included in the capital cost of developing the mine. The transport of the DRI will not be dedicated. An additional 1–2 mtpa of capacity need to be created on the railway line in order to facilitate DRI exports if the Darkhan expansion goes ahead and an additional DRI plant is constructed in Sainshand on the railway line. Sainshand is located closer to high-quality coking coal than Darkhan. The production of 2 million tons of DRI has an annual potential export value of \$800 million. The DRI could be used to feed arc furnaces to produce steel in Mongolia, as is currently done in India and Bangladesh.

Other minerals such as gold, molybdenum, zinc, uranium, and manganese, have been identified as commodities with beneficiation potential.

There is little local appetite for uranium, given by the volatile global price. Manganese is a value mineral used in the production of lithium-ion batteries, but Mongolia exported just 22,322 tons in 2017 and 3,747 tons in 2018. The government does not list it as a key mineral with proven reserves, casting doubt over the volume of Mongolia's manganese reserves. Although China is the world's largest manganese consumer, ideally Mongolia would use any manganese it mined to produce steel rather than exporting it.

If a DRI plant is developed, it should include a business case for branch line or feeder road activities for raw input minerals. For export of its products, a railway line will have to be considered. Assessing capacity and demand should consider three scenarios: agro-processing expansion, hard industrialization, and transit freight. Scenario 1 is based on current resources and the elimination of waste in the supply chain. Scenario 2 is based on potential resources and the creation of new products. Scenario 3 takes account of current stakeholders' wish to increase transit traffic. The

capacity of the railway line should be prioritized to facilitate the different scenarios in such a way that the diversification of Mongolia's economy is not constrained with uncompetitive exports caused by high transport costs.

To optimize the pit-to-DRI plant transport of coal and iron ore, the proposed DRI plants are planned for Darkhan and Sainshand.

In the case of coal, consideration should be given to building the new railway line from Nariin Sukhait via Tavan Tolgoi to Sainshand as part of the Planned Railway Line in Short Term indicated in red in Figure 4.14. This line would attach the two large mines by rail to Sainshand and allow for railing south to the Chinese border for transloading (Figure 4.13). The 226-kilometer section of railway track between Sainshand and the Zamiin-Uud/Erenhot border with China would experience the largest increase in traffic density, as coal, DRI and possibly even iron ore exports flow to the border. This section would have to be upgraded to a double track in the future.

Although the government is committed to building the rail link from Tavan Tolgoi to Zuunbayan, there is little clarity of when, where, or how mineral processing projects will proceed.

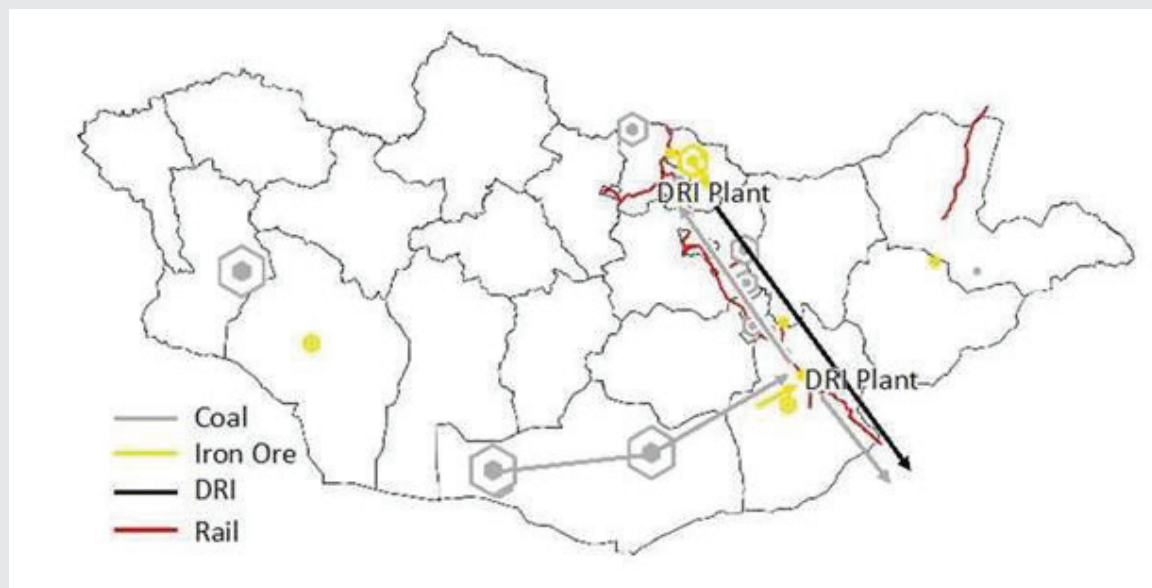
The lack of clarity partly reflects the need for further feasibility work (in the Darkhan steel project, for example). Other challenges include a possible lack of agreement about which projects should be prioritized (for example, the cases of a competing Erdenes Steel project and limited progress to secure support for copper smelting and refining between the government and OT).

Border delays result in losses of time, imposing high opportunity costs.

At the Zamiin-Uud border, cargo needs to be transloaded onto the Russian gauge before it can be transported further. Studies report delays of up to 43.5 hours at the border post, including 0.5 hours for customs inspection, 1 hour for reissuance of documents, 8.4 hours for congestion at reloading facilities, and 33.6 hours for transloading. The lack of transloading capacity at the Zamiin-Uud border post increases travel time between Ulaanbaatar and Vladivostok by 20 percent.

Figure 4.13

Proposed pit-to-DRI plant railing of coal and iron ore and coal exports



Implementing the “Long-Term Program for the Modernization and Development of Ulaanbaatar Railways until 2030” would more than double the volume of freight transport in Mongolia. Increased capacity on the Trans-Mongolian Railway has the potential to serve as the backbone that will support Mongolia’s economic diversification strategy. The Trans-Mongolian modernization project consists of replacing the existing SALB system radio-based train control (RBTC) system from Bombardier Transportation over a distance of 1,100 kilometers that includes 68 stations and 958 switching points. RBTC is a complex system that implements communication based train control (CBTC) principles with moving block functionality for trains equipped with RBTC and automatic train protection (ATP).⁴⁹ RBTC has the capability to work with conventional trains equipped the system. All traffic management will be organized from a centralized traffic control center in Ulaanbaatar.

A proposed alternative for Mongolia, based on international best practice, would enable rapid transloading of bulk minerals like coal and

iron ore to address the break of gauge on the Zamiin-Uud/Erenhot border between Mongolia and China. The proposed transloading facility includes a small arrival/departure/staging yard with a replenishment depot for each gauge a short distance from the transloading facility. The operating concept allows for a bulk train (6,000-ton payload or larger) to be transloaded from broad gauge to standard gauge in two to four hours from the loaded broad-gauge train arriving and the loaded standard gauge train departing. Such a facility can transload 25 million tons a year operating 350 days a year. It would double traffic between Sainshand and Zamiin-Uud. There is normally a small arrival/departure/staging yard to service trains on both sides of the border. They must include replenishment depots for crew change, refueling, vehicle inspection, emergency repairs, and predeparture inspection routines. The arrival/departure/staging yard is required for shunting of not-to-go/unserviceable wagons and locomotives and storage of spare sets. Bunched up trains, excess broad gauge-loaded trains, or empty standard-gauge trains can be staged on

⁴⁹ Automatic train protection (ATP) is an automatic override solution that ensures that a train does not exceed any permanent or temporary speed restrictions on a line and never exceeds its limit authority.

Figure 4.14

Proposed rapid train-loading system for bulk minerals



either side of the board-gauge train until they can be transloaded.

As it is unrealistic to expect a perfect situation, in which the loaded Mongolia broad-gauge bulk train arrives at the unloading station at the same time that the empty Chinese standard-gauge bulk train arrives at the loading station, it is necessary to introduce a buffer of at least one trainload. To do so, during transloading, rail wagons passing over the unloading station dump their bulk minerals onto a conveyor belt that runs parallel to the static loading station bins (Figure 4.15). The conveyor belt is equipped with an indexer that sequentially directs loading of material into bins. The conveyor indexer directs the bulk material from the first unloaded wagon to the first empty bin, unloaded material from the second wagon to the second empty bin, and so on until the entire broad-gauge train has been unloaded into the “stationary train on stilts.” Once all the bins are charged, an empty standard-gauge train can be placed under the bins for loading. Ideally, an empty standard-gauge train is placed under the loaded bins soon after unloading.

Several technical solutions could solve the operational challenges in transport for Mongolia’s mining sector. New and expensive infrastructure is not always required. Improvements in rail signaling, minor upgrades in sections with speed restrictions, and better control of train movements may be sufficient until freight volumes increase.

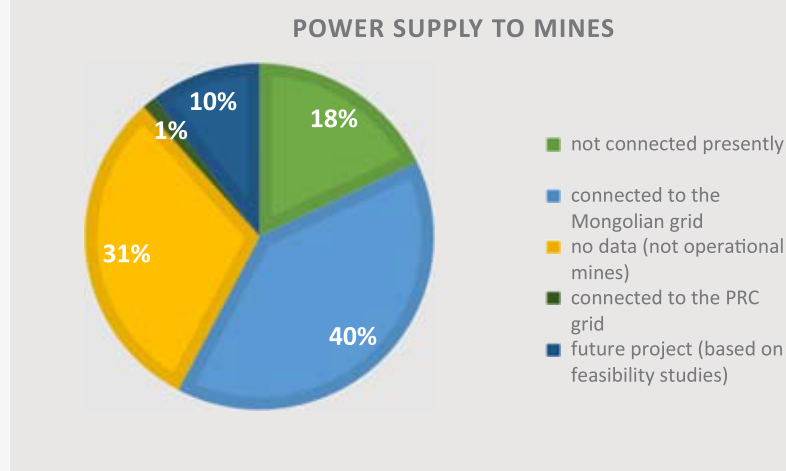
4.2.3.2 Power

Access to reliable power is critical for optimal development of mineral value chains. Development of mineral deposits has been restricted only to those with limited power needs or the few that can absorb high costs imposed by having to rely on captive generation (Figure 4.15). Remoteness from grid-supplied electricity acts as a constraint on some opportunities for value addition that are energy intensive, especially at the mine site. For mineral processing located away from mine sites, the benefits of gaining reliable access to the grid and perhaps road and rail connections must be weighed against the cost of transporting mined minerals to

Figure 4.15

Power supply to mines

Note: Figure is based on number of mines, not power consumption.



that location.⁵⁰ Feasibility assessments of the integrated Darkhan iron ore to steel project are based on this assumption about infrastructure being available for mines; they are likely a major consideration in the case of a copper smelter and refinery plant at Sainshand.

Mines and heavy industries are estimated to have used 3.6 TWh of electricity in 2019, of which only 1.6 TWh (44 percent) was sourced from the Mongolian grid, 0.7 TWh (20 percent) was auto-generated, and 1.3 TWh (36 percent) was imported by OT from China's IMGC. The high proportion of auto-generation reflects the remoteness of about 18 percent of mine sites or the use of back-up diesel generators to compensate for unreliable grid supply.

Timely expansion of generation capacity and transmission network extension to reach remote mines could increase demand for grid power from existing mines and heavy industries by 10 percent (0.3 TWh) by 2025.⁵¹ New mines and mineral-processing plants surveyed in preparation for the Energy Master Plan could add another 0.5 TWh of demand. These figures suggest that significant potential scaling up

of power demand from just one sector of the economy, which would help increase the revenue base of the power sector. Mines and mineral-processing plants can serve as anchor customers; they provide an opportunity to leverage mining power demand and capital investment in power infrastructure development. The sector can play a major role in underwriting the costs of strengthening the grid to deliver more reliable electricity supply and extend the grid to a wider range of load centers. Extension of transmission lines to the major mining deposits located in the South Gobi, including the vast OT mine, is planned. The first 250 kilometers were recently commissioned. New generation capacity is also required to supply additional power to the grid.

The infrastructure requirements of both Erdenet and the OT copper mines have been sufficient to support the current scale of their operations. In the case of OT, however, the underground phase of mining, which requires several years of construction, will result in much higher production rates. They will be associated with higher consumption of power and water, and larger volumes of concentrate will need to

⁵⁰ In a scenario in which the Darkhan and possibly other iron ore projects would proceed at least to the stage of producing DRI, it was estimated that an additional 1–2 million tpy of capacity would need to be created on the Trans-Mongolian Railway line to handle exports.

⁵¹ This estimate is based on data collection by World Bank staff.

be transported. There is a plan to build a 450 MW power plant at Tavan Tolgoi that will also serve the OT mine, but project sanction and financing have yet to be secured.

4.2.4 Infrastructure to Support Tourism and the Service Sector

Improving urban mobility in Ulaanbaatar, where half of Mongolia's population lives, is the key to developing the tourism and service sector. Infrastructure for tourism includes hotels, convention centers, and other amenities. These facilities are usually developed by the private sector, but public infrastructure and services are critical enablers. Increased air access would facilitate the ease of regional and international travel. Completion of the new Ulaanbaatar airport has the potential to address some of the current air access gap. An efficient public transit system is required to transport people from the airport to the city. The zoning of high-value hubs that include accommodation will provide the basis to drive growth in the service sector and support conference facilities.

Transportation in Ulaanbaatar is characterized by high congestion, poor-quality infrastructure, inefficient public transit services, increasing pollution, rising road fatalities and injuries, and underfunded sector governance. Increased economic activities and sustained rate migration from rural areas have led to significant increases in demand for urban transit in the city. Rapid motorization has resulted in congestion, and the very large share of second-hand imported cars and buses contribute to ever higher rates of emissions. Public transit service is unreliable, is of poor quality, and is not able to compete with private cars, which crowd the city streets. Road accidents are on the rise, partly because of lack of road safety considerations in planning and management of the urban road network. Demand for urban transit infrastructure and public transit facilities and services cannot be met, because of inefficient sector governance, including lack of strategic vision, evidence-based planning, and limited funding and financing.

The effects of these problems are greatest for vulnerable and lower-income residents, who live on the city's periphery and lack access to public transit. Average commute time in Ulaanbaatar was estimated at 37 minutes, which is relatively long given the population and size of the built-up area. It exceeds the average commute time in Seoul, which has 17 times the population of Ulaanbaatar and four times its built-up area, and Jakarta, which has 25 times the population and 6 times the built-up area (World Bank, 2015). Most commutes in Ulaanbaatar are estimated to take almost twice as long by public transit and walking than by car (World Bank, 2015).

Ulaanbaatar's 1,190-kilometer long street network is sparse, disconnected, of poor quality, and vulnerable to climate hazards. The recent urban construction boom has exacerbated the lack of connectivity in the city. The street network was not planned with a clear strategy, and roads do not have clear functional hierarchies. The road network came together incrementally, according to the needs and resources available at different times. The infrastructure is deteriorating because of lagged repairs and maintenance. Planning and management of the road network has yet to integrate climate resilience considerations, one of the main causes of quick deterioration of Ulaanbaatar's road infrastructure. The overall street network lacks convenient pedestrian and nonmotorized transport facilities that would help curb the increased use of private cars in the city. The construction and rehabilitation of new and existing arterial and secondary roads need to focus on creating better linkages within the city and improving pedestrian and public transit facilities to create a safer and more convenient environment that discourages the use private cars.

As a result of high operating costs, insufficient revenues, heavy dependency on subsidies from the city budget, and inability to manage business and revenue risks, Ulaanbaatar's public transit system is financially unsustainable and provides poor service. These problems stem from ineffective and inflexible fare policy, high levels of fare evasion, low fleet productivity,

a dysfunctional bus operators' contract, and inefficient route design and service plan. The strategy to improve the competitiveness of public transit should include the following components:

- reforming the sector's institutional structure and framework in a way that separates policy making from management of the sector, adopts a commercial approach to managing the bus system, creates a viable business model and operator contract structure for bus operators, and implements an efficient fare policy
- upgrading the fleet, ideally with electric buses for improved environmental sustainability
- upgrading public transit infrastructure, such as terminals, depots, stations, and ITS
- implementing bus priority measures
- establishing an integrated public transit network with customer-centered route design and service plan
- potentially introducing mass transit infrastructure.⁵²

Ulaanbaatar's mounting traffic congestion is partly exacerbated by the lagging traffic management and roads safety considerations. Low-quality intersection design and inefficient traffic management, including poor signal timings, brings chaos to intersections. The lack of parking management create more congestion, as parked cars occupy road and sidewalk spaces and queueing blocks the road carriageway. Given the low status afforded to traffic management compared with new road construction, the capacity and resources for traffic management are weak in Ulaanbaatar. The concept of traffic management in Ulaanbaatar has focused on enforcement and operational and control measures rather than on planning, design, and engineering. Such traffic management techniques tend to respond to problems as they occur rather than preventing such problems from occurring. Techniques tend to be old-fashioned and reactive. Ulaanbaatar has no

traffic management database or comprehensive management system, and it makes little use of traffic management data. The city has a window of opportunity to tackle congestion and road safety in an innovative way before poor traffic management practices become too entrenched and difficult to change and new road building precludes the use of innovative traffic management approaches.

The city's transport infrastructure is quickly deteriorating, with lags in repair and maintenance caused by shortage in funds and inefficient planning practice. As at the national level, the Municipality of Ulaanbaatar's investment planning process lacks a unified approach, with multiple decision-making levels; it needs transparent and evidence-based investment planning institutional process that would effectively allow for more cost-effective transport investments (World Bank, 2018) The Road Development Department (RDD) is responsible for the planning and management of the road infrastructure in Ulaanbaatar. Its capacity for planning and managing its assets is low. The department has no unified inventory of its road assets. It lacks a long- and medium-term asset management strategy to prioritize its investments and maintenance expenses based on life-cycle costs and safety and resilience considerations (World Bank, 2020). It needs to establish an asset management inventory system and adopt medium- and long- term transport asset management strategies and plans. The World Bank transport team has been working with the city within the framework of multiple technical assistance projects to create the first ever transport asset inventory system, using a low-cost technological solution that makes use of artificial intelligence and machine learning. It is also preparing a suggested plan for Ulaanbaatar to use to develop and adopts it asset management strategy.

⁵² These recommendations are based on WB previous engagements with the city, that include Assessment of Ulaanbaatar's Bus Management and Information Systems and Sustainable Financial Strategy of the Public Transport Sector.

4.2.5 Energy Infrastructure

There is a strong link between electricity consumption and economic activity. Energy is a key component in activities such as mining and mineral beneficiation, the processing and storage of agricultural products, tourism-related services, and digital development. In order for Mongolia to develop a diversified economy, it needs to ensure access to reliable and affordable power when and where it is needed.

The energy sector is ill equipped to meet these challenges. Mongolia will need to address multiple issues related to obsolescence of infrastructure assets and production methods and practices that are unsustainable financially and environmentally. The energy sector also holds potential for new value chains to develop, especially the generation and transmission of green, renewable energy for exports to China and beyond.

Many energy infrastructure gaps need to be addressed to enable the other value chains described in this InfraSAP. The following issues need to be explored:

- The electricity infrastructure is aging and lacks spare capacity to absorb expanding demand. Which capacity expansions will be needed to ensure sufficient generation, transmission, and distribution capacity to meet the increasing energy demands for the system and for specific requirements for value chains related to mining, mineral beneficiation, processing and storage of agricultural products, tourism, and digital services.
- What is the least-cost way by which Mongolia can achieve the needed system expansion while taking account of environmental and social considerations?
- How can investments in a reliable and efficient power supply system that is fully up to the task of supporting existing and emerging value chains be funded and sustained?

These issues are being dealt with in ongoing technical assistance for the development

of the Mongolia Energy Sector Master Plan (ESMP) 2020, which is helping the government rethink how to achieve government priorities and sector development objectives. ESMP 2020 is providing a comprehensive plan for the sustainable development of Mongolia's energy sector based on a least-cost system planning model. The main purpose of the master plan is to prepare a framework for developing Mongolia's energy infrastructure as required to diversify the economy and support economic growth drivers. Such a plan will need to be prepared at regular intervals to reflect the energy demand of these key drivers for economic growth and the suggestion is that the government would update the energy sector master plan at least every second year to account for that assumptions change, and new priorities may need to be considered.

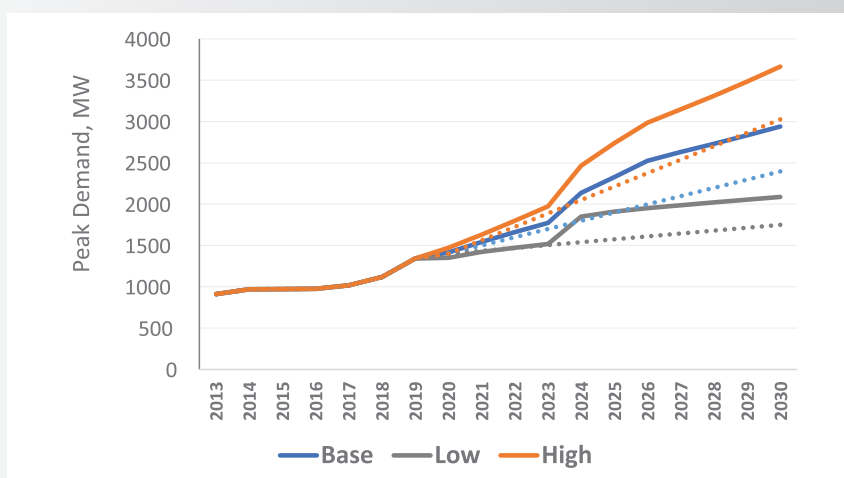
Between 2019 and 2030, average organic demand for grid electricity is projected to continue to grow by 6 percent a year. Total national consumption is expected to grow to 8.6 TWh by 2025 and 11 TWh by 2030 (World Bank, 2019). This consumption includes growth in residential consumption and sufficient power to develop the new value chains for agro-processing, tourism, and digital development described in this report. In addition, the figures reflect nonorganic (lumpy) growth from mining operations and mineral processing located far from existing generation and city centers, for example, which is expected to be an important driver of generation and transmission requirements to 2030. For smaller mines and mineral-processing centers, running a line to the existing grid should not pose a significant constraint to development. Larger mines, however, may need to construct dedicated power supply or attract private investment through independent power producer (IPP) schemes in order to generate sufficient electricity for the mine operations.

Nonorganic growth from the mining and heavy industry sector is expected to add significantly to total demand for power up to 2030. The base case used in the preparation of the ESMP 2020 estimates that in addition to connecting the 1.3

Figure 4.16

Load forecast scenarios from the Energy Sector Master Plan 2020

Note: Dotted lines represent organic growth.



TWh load of the OT mine to the Mongolian grid, new demand by existing and new mines and mineral-processing plants will add an additional 0.8 TWh by 2025 and another 0.6 TWh by 2030, bringing this sector's total grid-connected load to 4.3 MWh, up from 1.6 MWh today. This increase of 170 percent is predicated on the most realistic expansion of the industry's operations and the connection of new large remote loads.

The resulting power demand forecast indicates a doubling of peak demand from the 1.45 GW in the winter of 2019/20 to about 3.0 GW in 2030 (in the base-case scenario). Comparing this figure to the existing generation asset base of only 1.15 GW of firm capacity, most of which is nearing obsolescence, reveals the scale of the generation challenge. Even after counting the 250–275 MW capacity available to the Central Energy System from the interconnection with Russia, Mongolia will be seriously short of capacity in the winter of 2020/21, and the system will be running without a reserve margin. Solutions will need to be found both in the short and medium term.

Common for all scenarios is the need for significant investment in expanded cogeneration capacity, driven by the increasing heat demand in Ulaanbaatar and all urban centers. This is expected to add over 800 MW of power generation capacity, at an investment cost of about \$1 billion, between 2020 and 2026. The fuel will be coal or, depending on its availability,

gas, either coal bed methane or natural gas, from Russia. One important side effect of expanding cogeneration is the continued lack of flexibility in terms of accepting variable renewable energy (vRE) into the grid. As a first step to address this issue (as well as addressing potential peaking power shortfalls in CES), the government has decided to establish a 125 MW Battery Energy Storage System (BESS) with 160 MWh storage capacity, scheduled to be operating by the winter of 2021/22.

The government has decided to construct two new mine-mouth power plants in connection with the coal deposits in Baganuur and Tavan Tolgoi:

- The 700 MW (2 x 350) Baganuur power plant (Baganuur PP) is supposed to be a Build-Operate-Transfer (BOT) agreement. It was awarded to registered Mongolian company Baganuur Power LLC based on Chinese technology and financing of \$1 billion. The agreement is for 25 years. A major issue with this project is the lack of flexibility in the minimum-offtake obligation of 80 percent of total capacity, which create considerable inconvenience and commercial risk for the power system as well as locking in Mongolia to coal until midcentury.
- The 450 MW (3 x 150) Tavan Tolgoi power plant is supposed to provide power for the large OT mine in the South Gobi. Current demand from

OT is about 150 MW, supplied from China. A planned underground expansion could increase power demand by 80 percent. The project, based on a design from 2013, is estimated by the World Bank to cost \$900 million.⁵³ It has some unresolved environmental issues related to water supply.

Because of the power generation capacity coming from the needed combined heat and power (CHP) expansion, there will not be immediate need for either plant. It may be part of a least-cost scenario to construct the first stage of Baganuur PP before 2030, on the condition that its commercial terms are made more flexible; the second stage should be kept as a useful option to implement if that demand growth is higher than anticipated. Development of the Tavan Tolgoi power plant would be a costly way to support the OT mine connection compared with a combination of vRE power plants and initial power imports from China before integrating this solution with the CES via a B2B connection to the existing transmission line from China.

Expansion of solar and wind energy for domestic consumption will depend on the flexibility in the power system, through storage solutions and power exchange with Mongolia's neighbors. The abundant solar and wind resources in the south and southeast of the country offer an important potential for diversified economic development through export of renewable energy. However, the limited absorption capacity means that it will not be technically feasible in the short term to connect all the solar and wind projects that have been permitted under existing licensing procedures. During preparation of the ESMP 2020, least-cost options to scale up renewables were explored. If that flexibility is added, through storage or interconnection, an additional 1.2 GW of solar and wind could be installed in 2020–26, at a cost of about \$1.5 billion.

During preparation of the ESMP 2020, several new transmission projects were identified that will be necessary to provide sufficient and

reliable power to the main economic corridors (including all eight identified agro-processing hubs) and to connect the expected mining load. The following major investments are recommended, in order of priority:

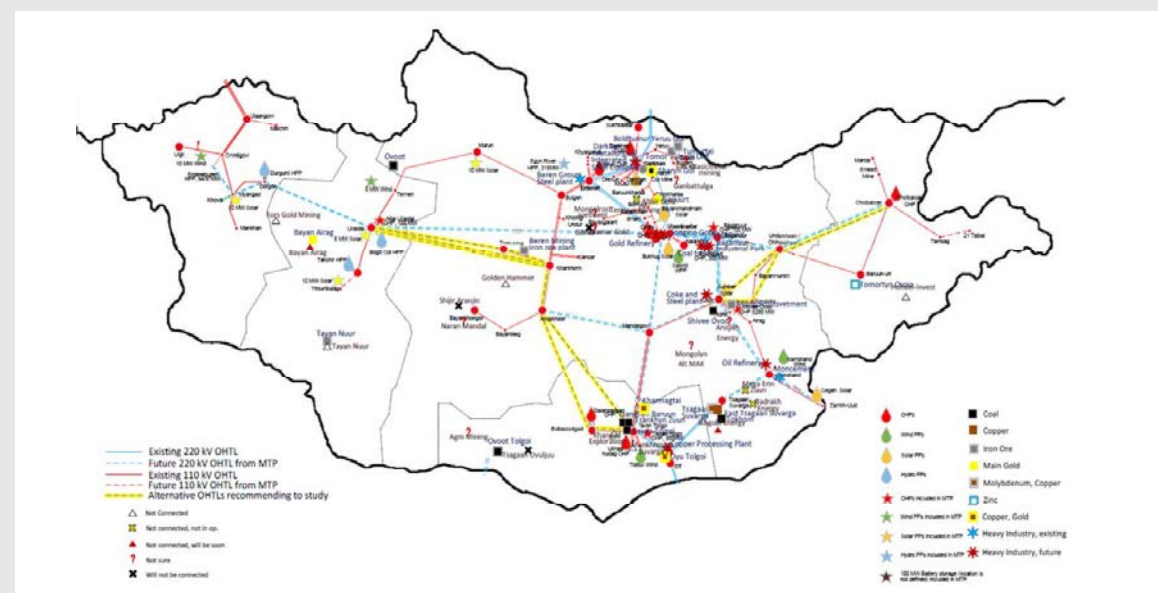
1. 220 kV Choir-Sainshand (\$48 million)
2. 400 MW B2B converter at OT S/S (\$200 million)
3. 220 kV Baganuur-Songino (\$57 million)
4. 110/220 kV Tashir-Mankhan (\$43 million)
5. 110 kV Tashir-Baynhongor (\$36 million)
6. 220 kV Baganuur-Choibalsan (\$114 million)
7. 220 kV Uliastai-Dorgon-Myangad (\$89 million)

The investment capital needed to close the energy infrastructure gap through 2030 is estimated at \$4.4 billion (\$440 million per year). It is composed of \$3.4 billion for power and heat generation, \$0.6 billion for electricity transmission, and \$0.4 billion for power and heat distribution. Given that annual government budget funding on capital investments to the energy sector has been under \$35 million on average for the last decade, the vast majority of these investments would have to come from the private sector. It is critical that the government use its own sources of funding (budget, loans from international financial institutions or other sources) to support needed investments in natural monopolies (such as transmission lines and dispatch) while leaving projects that can attract private sector investment to be financed using IPP and public-private partnership (PPP) models.

In the medium to long term, new value chains can create opportunities for economic diversion. They would come from regional energy connectivity, primarily renewable energy-based electricity exports to China (after 2030) and gas interconnection with Russia (after 2025).

Generation of renewable energy can contribute to Mongolia's economic diversification by creating new export revenue streams other than mining. The sector has been attracting

⁵³ The price of the 2013 project proposed by Marubeni was \$600 million, but that figure did not include water supply or electrical works.

Figure 4.17 Location of key mining facilities in relation to the existing and planned transmission network

more investments in recent years; it is in one of those sectors that has been most successful in attracting foreign direct investment (FDI). Renewable energy would contribute significantly to reducing greenhouse gas emissions and air pollution in the entire region. China would need to be presented with a good business case to import energy from Mongolia, and more high-capacity power transmission lines would need to be constructed from the Chinese province of Inner Mongolia to the main population centers in the east and south. Exports to China and other East Asian countries would be a long-term option under the initiative to interconnect the power systems of China, Mongolia, Russia, the Republic of Korea, and Japan, known as the North Asia Power Sector Interconnection (NAPSI or Asian Super Grid) launched by Japanese Softbank.

An interconnection to China would necessitate a high voltage direct current back-to-back (B2B) converter solution, because of the different synchronization of the alternating current (AC) grids in China and Russia. The B2B link would provide a source of flexibility to the Mongolian system and allow for more vRE to be developed and integrated into the grid. The role of the B2B can evolve: It could provide peaking shaving,

reserves/ancillary services, or baseload as needed. The initial size is suggested at 400 MW (at a cost of about \$200 million), but it could be expanded as needed. The B2B would replace hydro projects as a source of necessary system flexibility for a large-scale deployment of vRE and makes a power plant at the Tavan Tolgoi redundant as a source of stable power to the OT mine. Having this option strengthens bargaining power with Russia, as Mongolia would benefit from having two options for power imports. It would be advantageous to renegotiate the Russian import agreement to become a power trade agreement with two-way transfers equally priced.

Natural gas interconnection with Russia presents opportunities for both economic diversification and environmental benefits (cleaner air and reduced greenhouse gas emissions). As part of the “Power of Siberia” scheme to transport Siberian gas to China, the cross-border portion of the gas pipeline between Russia and China was commissioned in December 2019, with capacity to supply 38 billion cubic meters of gas from fields near Lake Baikal. Plans are advancing for a 6,000-kilometer gas pipeline to transport 50 billion cubic meters gas from the West Siberian Yamal Peninsula by the Arctic Sea to China and East Asia; it

would pass through Mongolia. Although the route has not yet been announced, it is likely to go along the central economic corridor (Figure 4.18).

This pipeline would generate transit fees and create opportunities for Mongolia to use natural gas in its heat and power sectors. Among other things, it creates an opportunity to replace coal and oil in all of the country's large heat and power plants, in major industrial plants, and for space heating in areas without heat networks. In the preparation of the ESMP, it was estimated that by 2030, Mongolia would need approximately 1.9 billion cubic meters of gas per year to be able to switch to gas in all coal-based power and heat-generating facilities in Ulaanbaatar. Such a switch would improve air quality in Ulaanbaatar and considerably reduce greenhouse gas emissions. The use of gas as a feedstock in industrial processes and in place of liquid fuels in vehicles, particularly in urban centers, represent further economic diversification opportunities that would need to be studied closely.

For Mongolia to get the most out of this opportunity, the government needs to take the following actions:

- Strike the right balance between benefits obtained in the form of transit revenues and

benefits in the form of access to gas and wider economy and environmental benefits, which might have to be traded off against one another.

- Recognize the implications of dependence on pipeline supply of gas, and reduce risk to the maximum extent possible in both physical (for example, storage and fuel switching) and contractual terms.
- Develop a clear regulatory framework within which potential uses of gas with strong economic merit (with emission benefits factored in) that are sustainable and not entirely reliant on policy support can be developed.
- Identify reliable, least-cost arrangements to deliver gas from the pipeline to points of offtake, with gas-processing and storage facilities taken into account.
- Leverage to the maximum extent possible the economic co-benefits of a pipeline corridor.

To address these issues, it is important to conduct studies evaluating a range of policy options; regulatory and institutional arrangements; and the economic, environmental, and social costs and benefits of harnessing gas.

Figure 4.18

Likely Routing of New Russia-China Natural Gas Pipeline



Recommendations for Investment in Target Sectors

- 5.1 Developing Strategic Infrastructure and Corridors for Economic Diversification
- 5.2 Funding and Financing Critical Infrastructure
- 5.3 Improving Institutions and Decision-Making Processes for Key Infrastructure



5

RECOMMENDATIONS FOR INVESTMENT IN TARGET SECTORS

5.1 Developing Strategic Infrastructure and Corridors for Economic Diversification

Recommendation 1: *The government should Develop a medium-term strategic plan with a priority list of projects that is selective (as opposed to having hundreds of projects) and based on a rigorous economic and financial assessment of their contribution to economic diversification.* Instead of projects being proposed by line ministries on an ad hoc basis, medium-term and subsequently annual plans should be informed by the national master plan and linked to the Public Investment Plan process. For example, the government should adopt the Energy Sector Master Plan 2020 as a comprehensive plan for the sustainable development of Mongolia's energy sector. All new major energy infrastructure investments should be initiated only if they are in accordance with this plan and consistent with the national development agenda. Consistency with broad plans should be ensures in transport and digital infrastructure as well.

Recommendation 2: *Develop infrastructure selectively to unlock the value chains most likely to support economic diversification and improve competitive advantage in the region.*

1) Infrastructure for meat, leather, and milk value chains

Strategic infrastructure for the livestock sector should be improved by upgrading key parts and missing links of the 4,300 kilometers of roads and four electricity networks connecting the eight hubs with the highest concentration of meat and milk. Interventions along the supply chain-including improvements in animal health, connectivity, transport infrastructure, refrigeration, storage, packaging, and so forth-need to be synchronized; individual interventions in isolation or not coordinated in time or sequence will not contribute to economic diversification.

Mongolia's meat export supply chain is probably operating at 10 percent efficiency. An effective and targeted infrastructure response could thus earn an additional \$850 million in export revenue annually and create a more stable and higher-quality domestic meat market. Intervention is not only about the physical road assets; it is also about developing a supply network of mobile

abattoirs, freight villages, a central processing hub, and effective intermodal interchanges, as well as road and rail upgrades on specific routes. All infrastructure needs to be part of a comprehensive set of interventions that result in reliable and high-quality meat products.

Eight hubs need to be established and connected at the following strategic locations: Uvs, Khovsgol, Bulgan, Arkhangai, Ovorkhankai, Tuv, Khentii, and Sukhbaatar. Doing so would require upgrading missing links from the 4,300 kilometers of roads as well as selected power transmission and distribution infrastructure and eventually introducing train services for the export market. Some of the 4,300km of roads are in good condition. A total of 138 kilometers of new roads needs to be constructed on the A18 and 141 kilometers of the A603 between Uvs and Arkhangai, 54 kilometers need to be built on the A2001 from Sukhbaatar, and 84 kilometers of new road are required on the A2001. At an estimated cost of \$330,000 per kilometer, the total estimated construction cost of new roads is \$120 million. The upgrade of electric power infrastructure to the relevant *Aimag* centers is expected to be part of the Energy Sector Master Plan 2020.

2) Infrastructure for mineral value chains

Selective infrastructure investments can unlock the latent potential of several mineral value chains. Ultimately, the whole economy would benefit, as the tax base grows by lifting the infrastructure constraint that has limited mineral value chains to projects that do not rely heavily on infrastructure or are able to absorb the high costs of self-supplied power and dedicated transport.

- **Power: Prioritize power sector investments that unlock unmet demand from mines and mineral processing for continuous grid-supplied electricity.** Only 44 percent of current power consumption by the mining and heavy industries sector is grid supplied. The rest is auto-generated by mines or imported

from China. There is thus a huge potential to reduce the electricity/operating cost of the mining and heavy industries and a huge untapped revenue base, comprising mainly creditworthy customers that could provide secure long-term offtake. Reliable power can be supplied in return for mines either directly investing in connections to the grid or making payment for supply linked to the avoided cost of having to self-supply or use back-up. The largest mines may prefer to construct their own power supply or to attract private investment through independent power producer schemes, through auctions, in order to generate sufficient electricity for own use. As far as possible, such generation should be linked to the grid both to allow surplus power to be supplied to the grid and for the mines to benefit from back-up from the grid.

- **Transport: Prioritize investments that enhance the competitiveness of traded goods by selectively piggybacking on rail investments needed for bulk minerals while relying on upgrading the road network as far as possible.** The government should reexamine its commitment to finance all planned new railway lines to export coal. A shift from road to rail haulage for coal in South Gobi is long overdue and would generate transport cost savings and reduce ecological damage, but there are mounting challenges to financing coal infrastructure, especially after the cancellation of the initial public offering for ETT. New railway lines for coal should proceed only based on a full life-of-asset cost-benefit assessment that considers systemwide benefits from interconnections, cost-effective supply of minerals for domestic processing, and opportunities for multiple uses and users. Appropriate weight should be assigned to stranded asset risk, which is a concern for thermal coal (demand for Mongolian coking coal is likely to remain firm in China over the next decade; prospects thereafter are less certain, as demand for coal-reliant steel-making plateaus).

Upgrading the Trans-Mongolian Railway is justified for many reasons addressed in this report aside from the benefits for developing mineral value chains. The competitiveness of minerals already reliant on that rail line would be enhanced, as transport time, which contributes as much to costs as tariffs, declined. It would also strengthen the feasibility of some mineral-processing projects in the rail corridor. The opportunity to transport raw materials more efficiently, whether sourced from domestic mines or imported, would weigh in favor of locating new mineral-processing plants in the rail corridor, especially if other critical inputs, such as power and water, are more reliably supplied there than at mine sites.

3) Infrastructure for regional connectivity and trade with China and Russia

The central railway line—the backbone of connectivity between Mongolia, China, and Russia—needs to be upgraded in a phased manner. Priority should be given to upgrading the signaling system and other technical systems on the railway infrastructure for the central economic corridor connecting China and Russia. Mongolia, China, and Russia will need to discuss how to share the costs of upgrading transit infrastructure, to ensure the equitable sharing of costs and benefits.

The cost of a full double-track electrified line is estimated at \$7–\$11 billion. Current volumes of traffic do not justify full reconstruction. About \$200–\$350 million would be needed to make minor improvements in sections, including speed restrictions, civil structures, and operations improvements to upgrade the system to carry up to 40 million tons of freight. Other major investments could then be made in a phased manner once cargo volumes increase.

Plans to construct a Russia–China gas pipeline through Mongolia open important opportunities for coal substitution in heat and

power generation as well as use as a feedstock in industrial processes and in place of liquid fuels in vehicles. An electric interconnection with China would facilitate mutually beneficial power trade and the longer-run development and export of renewable energy via the North East Asia Power Systems Interconnection project.

4) Infrastructure for urban mobility to support tourism and the service sector

With half the population of Mongolia living in Ulaanbaatar, a comprehensive and integrated approach is required to improve urban mobility to support the potential in tourism and the service sector. A strategy needs to be developed to improve the public transport system, by reforming the institutional structure and framework in way that would divide policy making from management, adopt a commercial approach to managing the bus system, creating a viable business model and operator contract structure for bus operators, and implementing an efficient fare policy. This strategy should also include upgrading the bus fleet, ideally with electric buses; upgrading public transport infrastructure, including terminals, depots, stations, and ITS; implementing bus priority measures; establishing an integrated public transport network with customer-centered route design and service plan and potentially introducing mass transit infrastructure; and upgrading electricity distribution infrastructure to provide adequate power for charging stations for electric buses. In addition, the condition of Ulaanbaatar's 1,190 kilometers of roads needs to be improved and maintained as part of an overall asset management program.

5) Digital infrastructure

The core digital infrastructure in Mongolia is in place. Missing are requirements for digital readiness to harness technological advancements, including efforts to increase the technology adoption rate, accessibility and

affordability of the internet, and the availability of financing and talent for digital technology start-ups and digital literacy among the public.

6) Renewable energy

The government should enhance its capacity in energy system planning and explore the potential for its rich renewable energy resources to enable an energy transition to mitigate the environmental and social cost of coal use. It should revisit its regulation on concession management and introduce competition through auctions instead of negotiated deals in the selection of renewable energy developers. It should also reevaluate its commitment to establishing new coal-fired capacity at Baganuur and Tavan Tolgoi in light of the alternatives of renewable energy. To support the potential of renewable energy, the government should carefully study the options for establishing large solar and wind power plants for the supply of indigenous power to the big mining operations in South Gobi and linking the Mongolia Central Energy System to the Chinese grid.

5.2 Funding and Financing Critical Infrastructure

Recommendation 3: Reduce the long Concessions List to a pipeline of 10-20 well-considered PPP projects with economic value and financial viability. Currently, the Concessions List acts as a “placeholder” for residual projects without budget support. Turning it into a credible, market-facing list of well-prepared projects would help the government sharpen its focus on priority projects that are likely to attract investor interest. A first step is to conduct initial screening of the projects in the Public Investment Program and selected annual capital projects for PPP suitability. Projects that may be suitable for PPPs should then undergo rigorous pre-feasibility assessments; be market sounded; and, if found to be viable, offered to the market with appropriate risk allocation on a competitive basis. Projects from other lists, such as the CMREC list, should also be included. A moratorium on

BT projects without adequate risk allocation should continue to be imposed. Support from international financial institutions in prioritizing projects should be solicited if needed. A more manageable pipeline of PPP projects could induce international financial institutions to offer partial risk guarantees or risk-mitigation instruments to de-risk projects and attract commercial financing. They may also be able to leverage climate funding or grant funding to support blended finance schemes to crowd in private financing.

Recommendation 4: Continue to improve the regulatory and investment climate, in order to attract foreign capital in infrastructure, which will be needed for some time. Improving the regulatory and investment climate includes increasing political and regulatory stability, observing the sanctity of contracts, and reinforcing the rule of law. Such measures would help reduce the risk for investors, reducing the cost of capital. With respect to PPPs, the regulatory framework could broaden its scope and application to address overarching issues across all project cycles, from initiation to completion. Procedural guidelines, handbooks, and methodology on how to conduct project screening, PPP feasibility assessments, public sector comparators, monitoring and evaluation, and fiscal risk assessment would help the government transition into best-practice PPPs. Roles and responsibilities of specific government entities should be identified and embedded in the relevant institutions, and linkages should continue to be made with the Budget Law. It will also be important for the government to establish a track record of honoring commitments made in contracts or, if there is a compelling reason for renegotiation, to ensure adequate compensation to the private party in order not to shake investor confidence.

Recommendation 5: Develop policies and regulatory instruments that promote advance planning of mining infrastructure with stakeholders and maximize the scope for such infrastructure to be multipurpose. Such an approach extends the life of the infrastructure

asset, reduces operating costs of the mines (and thus potentially increasing revenues for the government), creates economies of scale, and generates economic externalities associated with improved access to infrastructure services. Using mining to contribute to better coverage and quality of infrastructure would also support the government's diversification strategy, especially by focusing on corridors where mining and mineral processing overlap with and can promote other industries. Government policy should foster third-party access and multiple use/user regimes for connective infrastructure; in the case of power leverage, it should foster reliance on access to reliable supply and the ability of mines to enter into long-term offtake/use commitments. The past decade has seen many mainly failed attempts to strike the right balance between public and private interests, suggesting that lessons need to be drawn and a fresh attempt made to find a way forward.

Recommendation 6: Reassess the policy of holding equity in strategic mineral deposits and associated infrastructure, which may not represent optimal use of scarce public resources.

In principle, state equity can capture rents from mineral resources for the benefit of the country. Returns on equity in mining take a long time to materialize, however, and are subject to great uncertainty. Equity is financed on a working interest basis, exposing the state to a pro rata share of financing, including cost overruns. Given liquidity constraints, state equity has been financed mainly by borrowing. An exception is the OT mine, in which the private partners carry the state's interest.⁵⁴ The Mining Law already includes a provision allowing for royalty payments in lieu of equity, implying that equity is recognized as not always the best way for Mongolia to benefit from its mineral wealth.

Relying more on the private sector and less on the public sector to develop Mongolia's mining sector would free up a public funds to use on public infrastructure to support diversification of the economy. Better access to reliable public infrastructure could lower mining costs and increase mining profits and associated royalty and income tax payments while still allowing the infrastructure to earn a reasonable rate of financial return from user fees. There is also potential for privately financed mining projects to contribute to the financing of shared infrastructure-infrastructure that is open to multiple use and users-based on the avoided cost of building dedicated infrastructure. At a minimum, pending any change to its mandate from a revision of the state equity policy, it is important for Erdenes Mongol's plans for identifying, selecting, and financing infrastructure projects to be fully integrated into national planning of infrastructure.

Recommendation 7: Make investment decisions based on sound sector planning, and take policy and regulatory measures to facilitate the financing of key energy infrastructure investments, including energy pricing reforms to enhance the creditworthiness of the off taker, increase efficiency, and lower the cost of service delivery. On the supply side, the government should continually review load growth to capture the energy demand of the value chain development. It should follow a regularly updated least-cost master plan for infrastructure expansion and introduce auctions for concession arrangements instead of negotiated deals to reduce the cost of supply. These measures would help improve the creditworthiness of the off taker and ensure the financial viability of the sector. The government should also facilitate private investments in renewable energy generation and demand-side energy efficiency. Public financing

⁵⁴ Private parties prefinance the state's share, which they recover from the state's dividend entitlement, relieving the government from having to directly finance its share.

(or PPP arrangements where feasible) should focus on network enhancement, including cross-border connection, system rehabilitation, and modernization, to ensure supply efficiency and reduce the cost of services. On the consumption side, gradual tariff reform should move toward using long-run marginal cost considerations to inform tariff setting as well as introducing an automated periodic adjustment mechanisms that will assess efficient costs and investment needs and reflect them in tariff determination without a need for regulatory processing. The government should eliminate sources of price distortions leading to high subsidies in the energy sector, such as (a) including or not including the asset base in the tariff calculation (b) providing explicit cross-subsidy from electricity to heating, and (c) subsidizing the coal price and transport paid by generation companies. Increasing tariffs would likely necessitate compensating low-income and vulnerable households by means of targeted cash transfers.

5.3 Improving Institutions and Decision-Making Processes for Key Infrastructure

Recommendation 8: Design a more operational institutional framework for promoting the Trans-Mongolian corridor. This framework should include mechanisms for observing regional traffic, marketing the corridor, addressing logistics and trade facilitation bottlenecks, addressing interoperability challenges and challenges associated with trade, and attracting alternative financing and instruments for developing critical infrastructure needed for regional transit. The Ministry of Foreign Affairs should discuss with donors and the Ministry of Finance how to raise funds to undertake international standard feasibility studies on the 2 or 3 most viable projects on the CMREC list of 32 projects (including the backbone rail line and the backbone highway). Discussions with China and Russia should seek ways to jointly raise financing for critical transit infrastructure through a mechanism that allows for optimal risk sharing.

Recommendation 9: Create a central unit composed of representatives from various infrastructure ministries led by the Ministry of Finance, to ensure coordination, good planning, and prudent spending. A small number of experienced staff could play coordinating and steering roles with different parts of governments, with ultimate approvals remaining the responsibility of the Ministry of Finance. Such a process would help streamline the process of identifying, selecting, prioritizing, and delivering, critical infrastructure. It would also support decisions to assign the right staff to important projects. The National Development Agency would benefit from close collaboration with the Ministry of Finance and line ministries. The Ministry of Finance should play a gatekeeper role in approving projects, especially ones requiring large fiscal outlays. In addition, civil servant capacity needs to be developed to ensure that people with the right skills manage public projects. Incentives need to be put in place to reduce the turnover of professional staff even after election cycles.

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