Islamic Republic of Afghanistan

Resource Corridor Strategy and Plan

Making Mining-Based Growth More Inclusive

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INTRODUCTION

Afghanistan’s resource base is large and uniquely undeveloped. The country is endowed with a wide range of minerals, from well-known assets in copper, coal, iron ore, gold and oil and gas, to more speculative deposits in those minerals, as well as lithium and others. Yet discussions of the sector’s potential suffer from a lack of balance: some write off its development as unrealistic and long term, or fear it may trigger a ‘resource curse’ or ‘resource conflict’; others tout it as a panacea and a means, on its own, to self-sufficiency.

In reality, the extractive industry can be both a blessing and a curse, and is rarely transformative on its own. Investments in Afghanistan will only reach maturity over the long term, but some impact may be felt early. Even then, the resource sector itself will be large but not transformative: by the 2020s, it may create some 10-20,000 direct jobs, which is marginal on the Afghan scale; and the $700mn-1.5bn it could generate in government revenue (as of writing) will be insufficient to replace aid flows. As such, the sector’s impact must be leveraged for it to become a boon to the country. Doing so will be difficult, but relies on a sequencing of investments and reforms that are within the control of the Government of Afghanistan, the development community, and the domestic and international private sector.

A “resource corridor” is a development concept as much as a geographic one. It provides a means to articulate and integrate a sequence of actions. It is defined as “a sequence of investments and actions to leverage a large extractive industry investment in infrastructure, goods and services, into viable economic development and diversification along a specific geographic area”. The concept has existed for some time: in a sense, the developed world itself industrialized along resource corridors. In recent decades, resource corridors have been developed in Chile, Mozambique, Zambia and elsewhere (see Box 1).1

In Afghanistan, the Government has recognized the importance of such an approach in the National and Regional Resource Corridor Program (NRRCP), a National Priority Program (NPP). While a resource corridor will not be a panacea, it can be a powerful instrument to generate inclusive growth from a sector that otherwise might be an enclave of isolated activities. This will be particularly true if it complements interventions in agriculture and agribusiness, the other driver of growth in the coming decade. Challenges and risks, particularly in governance and the timing of resource investments, are significant and require combining and sequencing “soft” and “hard” interventions to maximize economic impact and inclusive job creation.2 Synergies between public and private interventions will need to be found and leveraged. The approach must be resilient to the uncertainty ahead, seeking to minimize waste if negative scenarios materialize and quickly capture benefits if uncertainties are resolved positively.

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1 See, among others, Mtegha et al (2012).
2 “Hard” refers to physical infrastructure, such as roads, rail and power, and the operational systems required for it to operate. “Soft” refers to social infrastructure, such as organizations for collective action, firm capabilities, skills, health services, cultural preservation, and so forth.
If that can be achieved, the resource corridor can be a new source of inclusive growth in the next decade. The remainder of this note spells out the potential; the actions needed to realize it; the scenarios for its development; and the resulting short-, medium- and long-term priorities.

**Box 1: Examples from elsewhere**

The first resource corridors coincide with the advent of the industrial revolution. Growth in Britain in the late 18th to early 19th centuries could not have happened without cheap coal, and the technologies developed for coal mining, such as the steam engine, later went on to transform the economy across sectors. Likewise, industrial growth on the European continent was first led by the *sillon industriel* (industrial corridor) in Belgium, with mining, steel, and steel users and engineering interacting to generate growth. This close spatial link between resources and industrialization was only broken in the 1960s, as a result of a sustained effort by Japanese government and industry, from shippers to steelmakers, to restructure the terms of trade.³

In recent years then resource-based development has had a mixed record. However, successes have occurred. The most notable has been Chile. As well as responsible fiscal management of copper revenues, it has built the region around its copper mines into an engine of growth. It used long-term skills and supplier development to create a high-value industrial and services base, while leveraging infrastructure and social programs to reduce poverty and raise human capital.⁴

The first resource corridor to be officially named as such was the Maputo Development Corridor (MDC), between South Africa and Mozambique, founded in 1995. To date it has helped facilitate investment of over US$5 billion in regional infrastructure development, industrial development, natural resource exploitation and downstream processing. This has included not only major infrastructure, but also one of the world’s largest aluminum smelters, an iron and steel complex, and numerous smaller investments in tourism, retail and manufacturing.

Another example, though more of a “pole” than a “corridor”, is a mining port on the bay of Fort Dauphin, Madagascar, which was made multi-use through incremental public funding. This allowed the region to diversify into tourism and eliminating famine by connecting the south of the island to regional food markets.

Of course, there are many negative examples of attempted resource-based development. The repeated fiscal crises and political and social turmoil that have stemmed from oil in Nigeria are well known. Even success cases have not been without blemishes: the original resources corridors, referred to above, created negative environmental effects that later had to be remediated, once those countries were wealthy. These both point to the importance, from the beginning, of a greater concern for environmental and social impacts, as well as building the governance capabilities needed to manage and utilize resource wealth.

³ Pomeranz, 2001; Ciccantell and Bunker, 2002
⁴ McMahon and Brandon, 2011
A. PROMISE AND UNCERTAINTY: THE DIRECT POTENTIAL OF AFGHANISTAN’S RESOURCE SECTOR

1. Afghanistan’s world-class deposits of copper and iron ore, and its mid-scale oil and gas fields carry the greatest potential. This section attempts to estimate the value of minerals that could be profitably mined in the next 20 years. Principal resources are shown in Exhibit 1. Identification of these is based on the results of recent samplings undertaken with the support of the Task Force for Business and Stability Operations (TFBSO) and the Afghanistan Geological Survey (AGS). In addition to the well-known Aynak (copper) and Hajigak (iron) deposits, another highly prospective 11 mineral resources were identified, seven by the Task Force and four by the AGS. Preferred bidders were announced in early 2013 for four of these, and another two (Aynak North and Sya Dara) are expected to be tendered in the future. In addition to minerals, Afghanistan also has at least two hydrocarbon basins: the modest Amu Darya basin, in which concessions for five blocks were awarded in late 2011; and the potentially much larger Afghan-Tajik basin, for which foreign and domestic investors submitted final bids in late 2012. Overall, the largest impact will likely come from the copper, iron ore and hydrocarbon deposits: benefits from hydrocarbons will primarily be financial; iron ore deposits will result in infrastructure and downstream development; and copper will generate a broad spectrum of financial flows, infrastructure, and provision of goods and services. Further potential lies in gold, lithium, and the country’s coal deposits. Unlocking the potential for investment, however, requires amending the legislation governing the sector. To that end, the adoption by Cabinet of a new Minerals Bill in 2013 has been a major step forward for the development of the extractive industry and the resource corridor strategy, although it still requires Parliament’s approval.
2. The Amu Darya oil fields have been the first to start production, with a small initial output but greater potential subject to exploration. The Amu Darya basin extends across Turkmenistan and Uzbekistan, with a rim in Afghanistan. In previous decades, five wells were drilled, but its full potential remains subject to speculation, pending the application of modern exploration techniques. In late 2011, rights to production and exploration in three blocks, containing the five wells, were awarded to CNPCIW, a joint venture between the Chinese National Petroleum Company (CNPC) and the Watan Group, an Afghan firm. The five wells contain 80 million barrels of oil in reserves and a further 80 million barrels in possible resources, and will produce 5 million barrels a year, or 15-20,000 barrels per day (bpd), at steady-state production. The rest of the field may contain substantially more resources, and will be the subject of an eight-year exploration program while initial production commences. The contract is structured as a Production Sharing Agreement (PSA). At current prices and steady-state production, GoA would receive approximately 70% of the income from the field once investment costs have been repaid—or $300-400m per annum by 2016-17 based on current development plans. Production began in late-2012 and is expected to ramp up over the course of 2013 and 2014.

3. The Aynak deposit, some 35-50km southwest of Kabul in Logar Province, is the most thoroughly known and will be the first mineral development to come on-stream.
Aynak is a world-class copper deposit, among the largest undeveloped worldwide. Its copper concentration of 2.3% is high by global standards (for comparison, Oyu Tolgoi in Mongolia has a 0.78-1.33% copper content).\textsuperscript{5} Extensively explored in earlier decades, it has the most complete geological data of the untapped mineral deposits. In 2008, a mining concession was awarded to MJAM\textsuperscript{6}, a joint venture of MCC and JCC, two Chinese state-owned enterprises that are partially listed. MJAM plans to produce 200,000 tons of copper cathodes per year, or an equivalent amount of copper concentrate, from Aynak. MJAM is also to build a 400 MW power plant, fueled by coal from a mine (Ishpushta, in Bamyan province) that they operate through a concession from the GoA. A portion of the power (100-200MW) is to be provided to Afghanistan at a cost to be determined in a power purchase agreement. MJAM is also required to contribute to a number of social projects in the mining community, as well as a contractually unspecified railway investment. Various issues, including the discovery of cultural artifacts at the mine site, security concerns, and, most recently, contractual discussions, have delayed the construction of the mine, but it could start production in late 2016 or 2017. Once investment has been amortized, the mine is expected to generate $250-300m in government revenue at steady-state production, based on a conservative copper price of $5,800 per ton. At current prices ($7,500-8,000 per ton), it would generate $400-450m in government revenue.

4. The award of the Hajigak iron ore deposit is currently under negotiation. It will require substantially more time and investment to become operational. The Hajigak iron ore deposit contains 1.8 billion tons of iron ore. While this is not especially large (under 1% of known global reserves), the ore is of high quality, at 62-66% Fe content. Moreover, its proximity to the potential coking coal deposits at Dar-i-Suf provide a potentially attractive base for downstream steel development, since coking coal deposits are rare by themselves and even rarer in proximity to iron ore deposits.\textsuperscript{7} In 2011, preferred bidders were selected for the Hajigak tender. Kilo Goldmines of Canada was awarded negotiating rights to one of the four blocks, and AFISCO, a consortium of Indian public and private companies (with majority ownership by the public companies, led by Steel Authority of India Limited, or SAIL) was awarded the other three. Contract terms were agreed in mid-2012, but final signature has been delayed pending approval of the new Mining Law by Parliament. Since Hajigak’s geology is less known than Aynak’s, the contracts being negotiated will cover several years of exploration, estimated to cost $75-100m, with subsequent exploitation based on exploration results. If exploitation goes ahead, AFISCO’s bid calls for $10 billion in investment, almost three quarters of which would finance a steel mill with an annual capacity of 7m ton, making AFISCO one of the top 30 steel producers in the world.\textsuperscript{8} A more modest first phase, prudently sized at 2-3m tons of steel per year, would still result in approximately $4-5 billion in investment. Recent statements from the consortium

\textsuperscript{5} Rio Tinto (2013).
\textsuperscript{6} MCC-JCC Afghanistan Mining Company.
\textsuperscript{7} Cordellt (2012).
\textsuperscript{8} WorldSteel (2011).
suggest it is pursuing the latter. Even at this smaller scale, the timeline for the Hajigak project, however, is substantially longer than Amu Darya’s or Aynak’s: with two to three years of exploration, followed by several years of construction,\(^9\) production would start only towards the end of the decade, ramping up early in the next. While the mine’s infrastructure needs and the downstream development around the steel mill could be significant, the fiscal effects would likely be more modest than for Aynak and Amu Darya, at least until the large investments were amortized.

5. **For each of these resources – copper, oil, iron – there may be significantly more potential beyond these three anchor developments.** In oil and gas, the Afghan-Tajik basin is being explored actively (by ‘seismic shooting’), and a tender has recently been launched for its exploration and production, with the preferred bidders announced in late 2012. Estimates of its size vary widely: the previous Soviet-era exploration suggested it could be several times larger than the Amu Darya basin. In addition, the ‘deep jurassic’ structures underneath Amu Darya might contain large amounts of gas. The total potential has significant variance, but an independent estimate suggests a 90% confidence range of 0.68-4.71 trillion cubic feet (TCF) of additional gas reserves in the north, with a mean of 2.4 TCF, and likely development ramping up between 2020 and 2030.\(^{10}\) In copper, the geologic belt stretching from Kabul southwest to Kandahar is believed to have significant potential for copper, gold and other minerals. A first deposit – at Zarkhashan in Ghazni – was tendered in 2012, and a preferred bidder selected in early 2013. Other copper deposits include Aynak North, Balkhab, and Shaidha. The scale of these deposits is likewise speculative, but their exploration is under tender or about to be so. Finally, a second large iron ore deposit is believed to exist at Sya Dara, some one hundred kilometers west of Hajigak. This deposit, however, is perhaps the least known of those with significant potential, and so its exploration and development is likely to take a number of years.

6. **Moreover, another three resources – gas, coal, and gold – are already in production, with the potential for further expansion.** While the gas resources in the Afghan-Tajik basin are subject to further exploration, there are known wells at Sheberghan near to the Amu Darya fields. These gas wells were in production several decades ago, though it seems the wells that may be developed would require a gas ‘sweetening’ plant for production. It is not clear how much power generation these fields could supply (estimates range from below 50MW to 200MW or above). A step forward for the rehabilitation and commercialization of these wells was taken in early 2013, when TFBSO started rehabilitating the pipeline connecting them to Mazar-i-Sharif, and the ADB initiated work on the eight wells themselves. Initial seismic survey work is also taking place on the Kushka Basin, near Herat, where there has been some speculation over the potential for very large gas discoveries. Afghanistan also produces coal, with a belt of coalfields from Ishpushhta to Dar-i-Suf and Balkhab. The Northern Coal Enterprise currently produces approximately 1m tonnes of coal per year; the Ishpushta coal fields are expected to

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\(^{10}\) Gustavson (2012).
produce another 1.5m for the 400MW power plant for Aynak (though MCC claims that their exploration results may cast doubt on this figure); and the Dar-i-Suf fields may contain significant coking coal deposits. Knowledge about these deposits vary, and further development raises trade-offs between domestic use of this coal in power generation or steel production, versus exports. In a best-case scenario, these deposits could have significant potential. Finally, many of the copper deposits have associated gold, and some self-standing gold deposits have also been identified. One, at Qara Zaghan in Badakhshan, has been awarded to a private consortium of domestic and foreign investors. Others are part of the upcoming tender process.

7. **Potential may exist in additional minerals, for example in rare earths and lithium.** The USGS has reported there may be significant lithium deposits in the dry salt lakes of Western Afghanistan (which share characteristics with those in the ‘lithium triangle’ of South America). Demand for lithium is rising with the use of advanced batteries (their principal user), and these possible deposits may have significant value in the future. A deposit at Namaksar (Herat) should be tendered in the coming years. In addition, there may be potential for rare-earth production at Khanneshin in Helmand Province. Rare-earth prices have risen in recent years—although they have now stabilized—and a number of countries (including the US, Australia, Kazakhstan, Vietnam and Canada) are actively pursuing the development of new deposits. The large environmental impact of rare-earth production—including significant toxic, and sometimes radioactive waste—and the complexity of downstream beneficiation implies development will take at least four to five years after commercial exploration is completed. As such, the market structure for lithium is far more favorable in the long term than that for rare earths. In both cases, however, development will take several years.

8. **Even these broader developments may not be the end of the story.** Basic geological work in Afghanistan has been limited in the last 20 years, and very little intensive exploration has taken place. It is therefore highly likely that a number of attractive medium- and large-scale deposits still remain to be discovered. In this regard, the Government of Afghanistan has undertaken steps to improve its capacity to effectively and transparently regulate Afghanistan’s mineral and hydrocarbon sectors, and to foster private investment in these sectors. These efforts have so far resulted in a modern mining bill (potentially to be approved by mid-2013) and regulations (to be approved by late-2013), a mining and hydrocarbons cadastre, a functioning mining and hydrocarbons inspectorate (in progress), and a modern Afghanistan Geological Survey (in progress).

9. **Cumulatively, the potential for resource production in Afghanistan is significant, but volumes are uncertain.** Such uncertainty is compounded by the volatility of commodity markets. At present, most commodity markets are at, or near, prices that have rarely been seen in decades, even after experiencing downward trends over the last twelve months. While the price of iron ore has dropped recently, it remains at roughly $130 per ton (for 62% Fe). From

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11 Stratfor (2010).
1982 until late 2004 iron ore prices hovered around $30-40 per ton (nominal) or lower. The growth in China’s steel production – from 152m tons in 2001, or 18% of the world total, to 627m tons in 2010, 44% of the global total – has accounted for this rise. For various reasons, the structure of Chinese demand is expected to shift by the end of the decade, and several analysts forecast that iron prices will decline to $70-100 per ton by 2020. While copper’s current price is less inflated relative to long-term trends – at roughly $8,000 per ton, vs $2,000 per ton in the decades before the 2000s – it can be highly volatile: it dropped almost 30% from May 2006 to January 2007, and fell 63% from April 2008 to January 2009, before doubling in just eight months. While the International Energy Agency (IEA) estimates oil prices will remain elevated through the decade, the oil market’s volatility – and the dangers of fiscal dependency on oil revenue – are well known. Such commodity price risks can be driven by factors beyond Afghanistan or even the commodity sector: in 2008-9 the global financial crisis caused commodity prices to drop over 50%. Should current tensions in global financial markets become another such crisis, commodity prices could be expected to undergo similar volatility again.

10. **Even beyond market uncertainty, the timing of resource investments is subject to significant risk of delays if global or local confidence wanes.** One of the most critical risks lies in the potential delay of promised mining and hydrocarbon investments. The global mining industry’s investment outlook can change swiftly: in 2011 BHP Billiton had planned to invest $80bn by the end of 2015; in 2012, it was scaling this back significantly, possible by as much as half. Its chairman said in May 2012: “Where the industry previously lacked investment opportunities and choice, it now has more projects than cash flows.” In early 2013 several of the world’s largest mining companies wrote down the value of major assets by billions of dollars, causing the resignation of two CEOs. Such turbulence will impact fiscal sustainability, the credibility of the sector’s development (and hence its ability to induce indirect investment), and potentially overall stability. This will only be compounded by the potential impact on business confidence of the upcoming elections in 2014, the withdrawal of foreign troops, and the decline in foreign aid.

11. **The development of this sector, in and of itself, will be closely connected to the domestic and regional political economy.** The “Transition” period, lasting until the end of 2014, will witness elections, the withdrawal of foreign troops, and changing patterns of aid. The stability of the country through this period will impact the timing and indeed feasibility of the resource sector investments. So too will the surrounding geopolitics, and specific risks of capacity and coordination in the GoA and the development community. Given the scale of revenue generation and investment, the resource sector will interact significantly with the political economy of local communities, the surrounding province, the country at large and regional geopolitics. At the most local level, as the World Bank’s extractive industries for development (E4D) initiative puts it, ‘a mine will not succeed in a community that fails.’ Using...

12 Roper and Zhao (2010), among others.
13 As per London Metal Exchange (LME) historical data.
development funds to improve livelihoods for local beneficiaries will be crucial to promote inclusiveness. At the same time, the attitude of provincial actors, state and non-state, will affect the ability of investments to proceed efficiently, operate securely, and be properly monitored. The provincial political economy, for example, has been a constraint on the management and governance of customs revenues. Needless to say, the provincial, national and regional political and security situation will weigh on the ability of investments to proceed, and the pace at which they do so. At all levels, stakeholders will expect tangible improvements in their livelihoods, which could create unpredictable societal dynamics. Beyond Afghanistan’s borders, the viability of particular import and export routes – and thereby the viability of some of the deposits – will depend on developments in neighboring countries and their external relations. In all, the development of the sector will be subject to significant risk.

12. **With such uncertainty, estimates can only be indicative. Conservatively, though, the sector will be a meaningful contributor to the economy and fiscal revenues.** If all the deposits are developed, foreign direct investment in the sector could amount to some $10-20 billion over the next decade; fiscal revenues will likely range from $0.7-1.5 billion p.a. by 2022-24; and exports from the sector could reach $10-12 billion p.a. during the same period. The impact on employment will be crucial and is discussed in detail below.

13. **Besides being uncertain, the resource sector’s direct impact, although large, will not in itself be transformative and may not be a source of inclusive growth.** Aynak is unlikely to generate more than 800-1,500 jobs. Most of these are likely to be semi- or fully-skilled labor, with contractual requirements to increase the share of Afghans in these jobs to above 75% within five years of production. Hajigak will likely generate around 4,000-5,000 jobs, and even the steel mill – if built with modern technology – will employ about 5,000 people only. The oil & gas industry will employ even fewer people directly. Even if all the other deposits are of similar size to these first ones, and employ a similar number of people, the mining sector in total would employ no more than 20,000 people. With the bulk of these being semi-skilled and skilled labor, and most lower-skilled jobs involving heavy manual labor, direct benefits for the poor and women would be limited. As for financial benefits, the revenues estimated above are already included in long-term fiscal projections, i.e., in a base case they would not address the financing gap and would not substitute in full for the withdrawal of aid. At the very most, financial revenues from the resource sector in 2022-24 would represent only 33-40% of current civilian aid. In other words, it will not by itself generate enough to substitute current aid flows. Moreover, without strong governance these funds might not be used to their full potential. In all, natural resources are unlikely to be a source of inclusive growth unless the sector’s direct impact is leveraged, and unless the challenges of inclusiveness and governance are addressed. To make mining more inclusive and broaden its impact, a resource corridor approach must be pursued.

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14 Based on characteristics of copper mines, iron ore and steel mills elsewhere (Altai, 2012a).
This approach will seek to maximize benefits through the sequencing of investments and reforms, while attempting to mitigate the multiple risks and uncertainties outlined above.

B. VISION: CATALYTIC INTERVENTIONS 2012-2024

14. **Underlying principles.** To realize and leverage the potential described above, the Resource Corridor approach is built on a set of core principles. First, the focus is Afghanistan, though the work is complementary to, rather than exclusive of, regional programs. More importantly, for incremental public investments, which are intended to complement private investments, **sequencing matters.** Neither GoA nor donors should make irrevocable decisions now that can be taken later (the principle of “flexible design”). They should not rush into investments that might be better funded by the private sector later. On the other hand, **risks must be acknowledged:** these include delays in mining investments; corruption and poor governance; deteriorating security; and government capacity. As a result of these risks and the prevailing uncertainty, short-term investments and actions should be justifiable on their own merits, rather than rely on mining projects (i.e., resources help prioritize investments, not validate them). Linked to that, **expectations must be managed:** short-term results will be real but modest, while most impact will be felt in the second half of the transformation decade. Lastly, **this is long term:** government, the private sector, and development partners have to stay the course.

15. **In the best-case scenario, “soft” infrastructure and “hard” infrastructure would be sequenced to create jobs and broaden economic impact.** To create these multiplier effects, the resource corridor approach will combine actions in four areas: physical, or hard, infrastructure; livelihoods; environmental and social impact; and governance (“soft” infrastructure). In all four areas, the objective is to create jobs and enhance incomes. In each, public-private synergies are sought, such as incremental investment to enable shared use in hard infrastructure, or public interventions to enable the domestic private sector to take maximum advantage of the mines’ demand for goods and services. The goal is to time public investments properly, not only those related to the first deposits but also for those that follow. This requires identifying public goods whose provision has wider economic benefits, but also raises the return of the large-scale anchor investments. This will ideally create a virtuous cycle, in which public and private investments interact to lead to broader growth, leading to an environment more conducive to further exploration and development, and in turn more growth.

16. **The first step is to identify the infrastructure, goods and services the sector will need, and how to leverage these in the country as much as possible.** The oil and gas deposits in the north need limited power and jobs, but do require transport and services. Specifically, Amu Darya will need to transport the equivalent of two trains of oil per day. It will also require $200-400m worth of labor and services in capex, and $50-100m in opex.\(^{16}\) Depending on its scale, the Afghan-Tajik basin will require a multiple of these figures. The broader development

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\(^{16}\) Altai (2012b). Based on comparable developments elsewhere.
impact of these investments will depend to a large extent on how much of this capex and opex can be supplied in the country. In terms of infrastructure, a medium-case development scenario for the gas in the north could result in significant gas-fired power being developed from 2020 onwards. This power could be generated in the North (possibly using byproduct gas from the steel mill, if it is located in Mazar) and sent south through a transmission line. Alternatively, the gas could be piped to Kabul, where a Combined Cycle Gas Turbine (CCGT) plant, for example of 500MW, would provide an anchor load followed by distribution to industrial users. Aynak will require large-scale infrastructure across sectors, and substantial inputs of both goods and services. Its initial operation will require 100MW of power, or 200-300MW if the construction of a smelter goes ahead. Exporting 200,000 tons per year of copper – concentrate or cathode – will entail 50 trucks per day transiting via Pakistan, almost certainly to the ocean. Constructing the power plant at Ishpushta will require hauling the equipment via Bamyan to Doshi. Obtaining “easement”, or right of way, over land will be necessary to build the associated transmission line. For Hajigak, the picture is complex: if the coking coal is of sufficient quality, the regional market for steel would make a 2-3m ton per year steel mill viable at Dar-i-Suf or Mazar; that would in turn require a rail link from Hajigak down to the coking coal and up to Mazar; gas generated by the steel mill as a byproduct could be used in a power plant of significant size (AFISCO has mentioned 800 MW in its bid) if that gas is mixed with natural gas; and a steel mill of this size would have an operating cost of almost $800m, of which $500-600m could potentially be spent domestically. Needless to say, the livelihood of affected communities around the Hajigak mine site, the coal fields and the steel mill would require improvements; the railway line would need land access; and Bamyan Valley’s cultural heritage should be protected.

17. In the short to medium term, these actions should be integrated along four segments, with three options for extension in the long term (see Exhibit 2). The first segment to come online will be developed in the north, around hydrocarbons. The second will be in the East, anchored on Aynak and the coal fields, while also touching the gold deposit at Qara Zaghan. The third segment is not anchored on any specific resource investment, but improves connections and expands the number of transport options for each of the resource investments and associated activities. This segment – the “cross Hindu Kush” – is anchored on the Salang Tunnel. The final segment is anchored on energy and steel, with a number of options on the size and nature of the actions to be taken, which will be clarified only after the next two to three years of exploration (e.g., dimensions of the steel mill and potential downstream activity; voltage level of power transmission). In terms of spill-over benefits, these last two segments will connect two of the three highest producing agricultural regions in the country, through which the first two segments run: the wheat growing areas of the north, and the diverse agricultural producing areas around Jalalabad in Nangahar province. In the longer term, three extension

17 “Easement” refers to the right to pass a transmission line over a given piece of land, which restricts a defined range of allowed uses of the land under the line.
18 Cordellt (2012).
segments may be plausible, depending on the conjunction of resource characteristics and other variables: first, the extension of the Eastern copper segment southwards, to incorporate Zarkhashan and other copper deposits which may be discovered; second, the extension of the northern segment to Herat, linking to the Iranian rail network and incorporating the copper deposit at Shaida; and third, in the long term, a heavy duty rail line south-eastwards from Hajigak and crossing into Iran or Pakistan to a port at Chabahar or Gwadar. To be realized, this last option would require a conjunction of favorable domestic security, favorable regional geopolitics, and sustained high iron ore prices.

**Exhibit 2**

**Overall corridor: short- and medium-term segments with potential extensions in the long term**

18. **Along each segment, “soft” and “hard” interventions would cohere to form an integrated whole supporting inclusive growth.** To take one segment as an example, short- and medium-term actions along the Eastern segment could include: on “soft” infrastructure, enterprise development in Kabul and the communities surrounding Aynak to enable the supply of goods and services to the mine and power plant (even if this is imported “second hand”); community development agreements (to ensure community benefits sharing) around the mine and the Ishpushta coal fields; strengthened land acquisition processes – for outright acquisition or right of way – along needed road and transmission lines; the acceleration of archaeological excavation at Mes Aynak; and building strong contract monitoring capacity to prevent revenue leakage (e.g., in assaying the produced weight of copper). “Hard” infrastructure investments...
would prioritize the road links stretching from near the power plant past Bamyan and Aynak to Torkham and then Peshawar (all of which have strong spillover benefits described below); strengthening the security of the power grid through planning, incremental investment and the creation of a ‘grid code’; and in water, potentially the largest challenge and opportunity, the needs of Aynak would require a sustainable solution to Kabul’s long-term water issues to be found. Each of these is detailed more below. Overall, they would multiply the employment generated by Aynak by up to five times, creating up to 6,500 indirect jobs, plus approximately 2,500 at or near Ishpushta;\(^19\) improve development outcomes for rural communities (e.g., in education and health); and produce the unquantifiable effect of a more robust road and power network, as well as a water solution for the 3-5m inhabitants of Kabul.

19. **In moderate scenarios, the total cost of hard infrastructure would be $7-9 billion across all segments over more than a decade, with the private sector contributing a third to two thirds, and most public investments benefitting other sectors.** An investment scenario for the four short- to medium-term segments would involve, across all the segments, substantial amounts of soft infrastructure. Programs would be piloted in one segment, linked to anchor investments, and then replicated or scaled up in others, hopefully incorporating earlier learning. Though such programs will have large economic returns, amounts required are likely to be relatively small. The quality of execution and the duration of financial contributions will therefore be more challenging to secure than the funding itself. Much larger amounts, however, will be required for investments in roads, power, water and rail. Approximately $3.5 billion is needed for links with a strong strategic rationale; another $2.5-3 billion represent a number of mid-scale options whose rationale is uncertain at present; and an incremental $2.5-3 billion comprises three large-scale options in the long-term.\(^20\) These amounts include infrastructure to be built by the mining investors ($2.5 billion), as well as already-funded projects ($1 billion). Excluding the three large-scale options, this leaves some $2.5 billion unfunded or with insecure funding. These amounts would be spread over the coming decade. When the private sector share is added to investments in the mines, fields and steel mill itself, some $3.5 billion in public funding could mobilize approximately $12 billion in private investment, not counting induced private investment in the mining supply chain and other sectors enabled by the corridor approach. The investments are detailed in the accompanying slide collection, and its key components are described below. To sequence and prioritize them into an investment strategy, the large degree of uncertainty that will affect any planning must first be taken into account.

**C. UNCERTAINTY, SCENARIOS AND RESULTING STRATEGY**

\(^{19}\) Based on a benchmark indirect multiplier of five for Aynak; plus 500 jobs at the coal plant and mine operation (estimate from similar power operations) with a similar multiplier.

\(^{20}\) As examples, a heavy duty highway upgrade from Kabul to Mazar; an 800 MW CCGT plant in the north; and the more expensive, but currently unaffordable or uneconomic, options for the cross Hindu-Kush corridor (e.g., incrementally larger upgrades to Salang and its bypass).
20. **Not all uncertainty is a downside risk: positive developments are also possible.** Plans and strategies should be built not only to insure against negative developments, but also allow the flexibility to take advantage of positive surprises. The two primary variables that might have outcomes more positive than expected are the size and scale of the next wave of deposits, and developments in regional politics. If hard and soft infrastructure interventions are not scalable, additional potential – e.g., in the gas fields or in opportunities for transit trade – may become stranded, resulting in very large opportunity costs. With this degree of uncertainty, over this period of time, the standard approach of designing for an “average”, with a limited number of sensitivity tests, is likely to be inadequate.

21. **As a result, the strategy must consider a range of macro scenarios and design options that can be triggered over time as one or the other develops.** However, with the enormous complexity of variables and interlocking uncertainties, designing for all permutations of outcomes – or “scenarios of cause” – is unmanageable. One can however distinguish between relatively distinct sets of consequences that a number of different sets of causes will generate, i.e. scenarios of consequence. Five such scenarios have been identified, and are described below from negative to positive.

22. **The first scenario, “collapse”, involves the resource sector investments themselves not occurring, leading to the potential for wasted or stranded public investments.** In this scenario, the resource investments are delayed for many years or do not take place. This could occur due to sustained political instability, in the country at large or near the resource investments, which would cause a collapse of private sector interest, or, at the least, a pause in investment lasting many years. It could also be caused by negative changes in the commodity cycle, lower than expected returns for the private sector, investors deciding to hold onto options until uncertainty clears, or conflict dynamics around the resource investments. The negative outcome in this scenario would be not only the absence of investment itself, but also wasted investment in hard infrastructure components whose rationale rested too greatly on the resource investments themselves. While this risk should diminish over time as some key uncertainties resolve themselves, it will remain for very large and dedicated investments (e.g., a railway investment to the south-east could be stranded if iron ore prices drop significantly). For the period of acute risk in the short term, the focus should be on interventions that have a strong rationale independent of the resource investments, to be prioritized according to their spillover benefits for these resource investments. This risk could be mitigated in part by developing public-private agreements that invest in win-win public goods that also boost private returns, but which are contingent on the timing and acceleration of the private investments (as was done in the building of a growth pole in Madagascar, where a dedicated minerals port was made multi-purpose with catalytic public funding).

23. **In the second scenario, extractive investments occur, but are ‘enclaves’, with barely any catalytic effects.** In this case, private investments take place and fiscal effects materialize, but to a limited extent. For instance, only some deposits are viable, due to security, deposit
characteristics, or commodity market movements. Infrastructure is built, but is built late, and is poorly maintained. Actions are not taken to induce broader improvements in livelihoods, as the private sector and rural areas do not take advantage of the new ‘hard’ infrastructure. As a result, only one or two segments are built, primarily in the north. The broader public does not see benefits from the resource sector, which therefore loses legitimacy. In this scenario, while investments in hard and soft infrastructure may not be entirely wasted, inclusiveness is limited, and the resource sector and corridor may not contribute to stability or broad-based growth. While some of these risks are beyond mitigation within the scope of the resource corridor approach – such as the deposit characteristics, commodity markets, and geopolitics – several actions can be taken to mitigate others: a heavy focus on building soft infrastructure in the short term, to be ready for hard infrastructure; address constraints in agriculture and the urban private sector to leverage the induced effects of hard infrastructure when it comes on-stream; and some of the actions within the governance theme, described in the relevant section below.

24. **In the third scenario, a single segment does become viable, and broader development takes place along it.** In a slightly more benign scenario, a limited number of anchor resource investments could come online, with broader development occurring across the related segments, but several other projects could fail to develop. This would apply in particular to the longer-term options, such as a mineral railway to the south-east (thus limiting the total volume of production from Hajigak). Such a scenario could result from a conjuncture of several variables, such as price declines in specific commodities but not others, difficulty in realizing transit trade, or delayed land acquisition, and delayed or poor quality construction of hard infrastructure. In this case, while the corridor would result in inclusive growth in some areas, that growth would not be uniform, and hence could create regional inequalities and tension. Since the primary causes for such a scenario would be largely exogenous, the risks are difficult to mitigate. On the one hand, this scenario implies that decisions should be made only when strictly necessary and with a strong dose of realism. On the other, since preparation often accounts for a much greater proportion of time than funding and construction, starting early (for example, by conducting feasibility studies for multiple specifications, or design studies before a final decision on funding) would build flexibility into the strategy.

25. **In a fourth scenario, multiple segments are built, but growth in the country as a whole remains vulnerable and constricted.** In this scenario, positive developments described at length above are realized, but ongoing activity remains vulnerable to external factors, primarily commodity prices and regional politics. For example, the steel and energy corridor could develop, but might operate with marginal returns, threatening to shut down when prices dip slightly. As another example, market forces could make all the segments or high production levels viable, but regional politics could prevent their realization through non-tariff barriers, rising costs on interconnecting transport systems, decreasing spare capacity in neighboring power systems, or other similar factors. Even if they do not prevent realization, such factors could significantly reduce the internal and economic returns from the investments and the
corridor overall. While relatively little might be done to reduce the probability of such a scenario, at least within the bounds of conventional ideas, building several options into both the overall strategy and specific investment choices might mitigate its impact. In other words, to the extent possible, investments should avoid “locking in” certain choices, and investments that can create new options – e.g., that allow switching between alternate export destinations – should be prioritized. This can involve both hard as well as soft infrastructure; as an example of the latter, any institutional plans for railway development should incorporate building strong capabilities for negotiating tariffs with neighboring countries.

26. The final scenario, though unlikely, involves full development, with a thriving corridor and deep integration. In this scenario, the internal political situation is favorable, commodity prices remain elevated across the board (e.g., if India’s manufacturing and construction expand), and regional politics are favorable to cost-effective transit. All four short-to-medium term segments are realized, with full benefits, as are the long-term extension options. As a result, a critical mass of infrastructure is built, while private sector capabilities fostered through supplying mining and oil and gas provide the seeds for other clusters, which use downstream outputs from the industry (such as steel and chemicals). The result would be a crowding in of other activities, and, over the long term, declining resource dependence. This will require the combination of multiple exogenous elements, as well as quick and effective execution across the themes in both the short and medium term. The strategy should not rely on such a scenario, as, even in a positive case, the two preceding it above are far more likely, but must be able to profit from it, if it materializes. This can be done, while keeping in mind the scenarios above, by timing decisions appropriately; sequencing design and construction processes to be as modular as possible; and building the capabilities in the Afghan public and private sector to take advantage of upside opportunities when they present themselves.

D. RESULTING INVESTMENT PRIORITIES

27. In light of such a wide variation in scenarios, the resource corridor’s potential investment program builds in flexibility from the outset. In the short-term, the strategy first prioritizes actions and investments that have a rationale in their own right, as well as those that will have benefits even in a period of significant uncertainty. In other words, the first actions will be those that are relatively more resilient to the first scenario. As an example, the road from Bamyan to Doshi, an alternate transmission line to the crowded and vulnerable route through the Salang Pass, or improved land acquisition, all have significant benefits even if the mines are not realized. Moreover, if structured appropriately, they may accelerate the realization of the investments themselves. If the private investments do occur, the initial actions will more easily integrate them into public networks, or facilitate incremental investment to turn them into public goods. Finally, even if instability occurs, as long as documents and studies are preserved, the effort of the next two years will not be wasted (as, for example, land surveys could be retrieved,

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21 de Neufville and Scholtes (2011).
or engineering designs used to restart work when stability returns). While not all short-term priorities will fulfill all four of these criteria, most fulfill at least three.

28. **Second, across the short, medium and long term, investments should be consciously designed to maximize spillover effects on other sectors.** For example, skills that have some degree of transferability should be prioritized, so that if the commodity cycle turns, those who received training might find new opportunities. Likewise, railways should be designed with the capacity to handle general cargo, even if the majority of the traffic is envisioned to be minerals (e.g., by specifying a loading gauge and clearance sufficient to handle double-stacked containers). By doing so, even if the more negative scenarios materialize due to adverse market movements, wasted investments and actions will have been minimized.

29. **Third, decision processes should be staggered so that options are made available but not selected until the appropriate time.** For example, design studies for 500kV and 220kV lines could be conducted side-by-side, with a selection made only when more is known about the gas and coalfields. Similarly, feasibility studies for transport routes that depend on transit regimes could be developed even while their later viability remains uncertain. Such steps could be relatively low cost, at a few percent of capital cost; others might be *a priori* expensive but have significant expected returns under a range of scenarios, such as building a transmission line at 500kV and running it at 220kV. While in hindsight, such additional investment might appear wasted once the scenarios have materialized, they will carry far lower costs than having to rebuild at different specifications or having built ‘white elephants’. Most of all, investments in soft infrastructure will facilitate the creation and selection of options, and lower the costs of switching among them. For instance, better planning capabilities in line ministries will facilitate the integration of new options into overall networks, and strengthened land acquisition will reduce the time costs of switching routes. To maximize expected overall economic value, the strategy therefore attempts to sequence actions, including soft infrastructure and preparation and design work, incurring extra costs in order to create options or delay decisions in the face of uncertainty. The specific components of the investment scenarios are described in depth in the remainder of this section.

I. **Infrastructure**

30. **Investments in missing road links.** These are: the Bamyan-Doshi bypass for the Salang Tunnel; the Salang Tunnel itself; the roads from Bamyan to Kabul; the highway from Kabul to Jalalabad; the highway from Jalalabad to Torkham and on to Peshawar; the road from Mazar-i-Sharif to Dar-i-Suf to Bamyan; and that from Andkhoy to Herat.\(^{22}\) Perhaps most importantly, the Salang tunnel will need rehabilitation. Some of these roads are already funded (such as Kabul-Jalalabad, by the ADB). Others, however, are not, and each has a strong strategic rationale aside from the resource investments. Aside from this, these roads connect together some of the more

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\(^{22}\) Wolden, Labeau and Noor (2012).
densely populated regions of the country. Programs to develop rural access roads could take their location as one dimension of prioritization. By reducing costs and time for cross-country and international transport, these roads may spark growth and jobs, but will do so for the poor only when complemented by a similar focus of relevant programs in other sectors. These investments would total approximately $1.5 billion over the next five to ten years (over approximately 1,300 kms), with O&M costs of some $15-20m per year.

31. **Effective maintenance arrangements for roads.** Without effective maintenance, investments in roads will yield marginal, if any, returns as road conditions deteriorate. This will be particularly true along the resource corridor, as large volumes of heavy trucks cause significant wear and tear. At the same time, attempts to reform road maintenance arrangements across the entire network will be difficult, and efforts to date have not yielded results. An incremental strategy is likely more feasible, and could naturally concentrate first on the road links identified above, plus the recently built Mazar-Andkhoy road and the under-construction segment from Andkhoy to Herat (these two requiring some $2-5m over five years). Here the challenge may not be the quantum of funding (especially in light of the ARTF O&M facility approved in late 2012) so much as the means of execution, and ensuring funds are stable and dedicated. A full-fledged “Highway Authority” takes time to establish even under more favorable conditions than at present, so the initial focus should be exclusively on road maintenance of a reduced road network as a first step. A *fuel levy* is said to have been approved in principle (potentially to be set at 2 cents per liter), which could annually generate enough funds for maintenance (routine and periodic) of the reduced network. Once the funding mechanism is decided, a designated account (*Road Maintenance Fund*) could be set up and managed by a small maintenance management unit (*Maintenance Agency*). This unit would contract out networks of roads of appropriate length to private “operators” that would in turn subcontract actual maintenance works to domestic contractors, providing much needed training and employment. This might start off with one or two pilot operation and maintenance contracts – possibly the Mazar-Andkhoy and Kabul-Jalalabad segments – then expand gradually. Strategic highways such as the Salang Pass may need special consideration.

32. **A more secure energy system.** The North-East Power System (NEPS) currently relies for most of its supply on imports from Uzbekistan and Tajikistan carried on transmission lines through the Salang pass and terminating at the Chimtala substation north of Kabul. If those lines or that single substation were to become inoperable, even for a short period, Kabul would lose almost all its electricity supply. The transmission line from Aynak to Ishpushta, and, later, Hajigak’s transmission requirements, provide an opportunity to leverage private investment to increase the security of the public network. Doing so will require above all the integration of planning and the development of a ‘grid code’ that would set out the technical requirements to connect new generation to the Afghan power system.

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23 The IMF, even within its strong support for a single budgeting process, has expressed qualified support for the principle of road funds. See Potter (2005).
33. Small incremental public investments may be required for the construction of an already planned substation on the southern side of Kabul. At the same time, integrating the Aynak transmission line would allow the redeployment of public funds currently earmarked for another transmission line through the Salang. These might be used elsewhere, or to fund the incremental cost to build the Aynak line at 500 kV (as opposed to the 220 kV required by MJAM), to be operated at the lower voltage at first. With further investment to extend such a line northeast, this would link up demand at Hajigak as well as potential supply from the gas fields in the North. These fields are likely to be a priority for power system development to increase wintertime capacity and to improve energy security by reducing dependence on imports. On the other hand, depending on the size of gas reserves, a pipeline to Kabul for generation and distribution in the city might make more economic sense.

34. Final decisions should be delayed until more complete information is available, but in the interim, the difficult work of planning and design should proceed across multiple options. The trust and coordination necessary to realize this strategy should also be built incrementally, starting with clear win-wins. As an immediate example, MJAM is considering building an approximately 100MW heavy fuel oil-based generation plant for its early stage operations. In Kabul, the USAID-funded diesel-based Tarakhil generating plant has a capacity of 105 MW and is running at about 5% of its capacity, since Kabul is supplied by cheaper imported electricity. A solution might be to use this idle capacity for Aynak’s early operations, which would require small investments in transmission and substations (needed later anyway) as well as the more complex task of negotiating an agreement acceptable to MJAM and DABS. Such a solution could rescue a stranded investment, reduce MJAM’s risk and cost, and be a stepping stone to larger agreements. It is however still being discussed, and should include safeguards to make sure it does not remove or reduce MJAM’s incentive to construct the larger plant at Ishpushta as soon as possible.

35. Commercialized rail links northwards. Afghanistan has suffered from “endless options” on railway development: a proliferation of proposals that if all realized would generate “one of the densest rail networks in the region”. This detailed review, however, has found that most of them are unlikely to be feasible as currently conceived. This likely includes the railway option proposed by MJAM in their initial study on any of its specific routes. This railway is expected to cost more than $8 billion, interconnect with neighboring systems unlikely to handle the volumes needed to make it economically or commercially viable, and could become a long-term fiscal drain, particularly if it carries small volumes of passenger traffic (as is envisioned in the initial design documents).

36. For reasons of terrain, potential traffic, and interoperability, the routes which appear to have the clearest rationale are: the rail line from Mazar-i-Sharif to Andkhoy, with spurs to Turkmenistan and Amu Darya, which will generate two trains per day (this line already has

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24 HWTSK (2012).
funds allocated in the ADB’s Multi-Tranche Financing Facility, the Transport Network Development Investment Program); a link between Herat and the Iranian railway system, partially built by Iran, but which requires a substantially redesigned final segment – so far unfunded – to make it viable for general cargo; and a line from Hajigak to the potential coking coal fields at Dar-i-Suf and thence to Mazar-i-Sharif (dedicated for minerals in one direction, but with backhaul that might carry cargo from Herat to Bamyan). The AFISCO consortium has indicated it plans to spend $1bn on the first, more difficult part of this link; funds for the remaining 150km, on relatively simple terrain, would need to be found (approximately $250-500m). The feasibility of this railway would rely in large part on the volumes produced by the steel mill, whose attractiveness and size would in turn depend on the size and quality of the coking coal deposits.

37. In the longer term, a dedicated mineral railway to the south-east, leading ultimately to the port of Gwadar in Pakistan or Chabahar in Iran, could become a viable export route for the bulk of Hajigak’s iron ore production. This would require favorable national and regional politics, and a takeoff of steel demand in India that would sustain high iron ore prices. Another long-term option could be the extension of the northern rail down to Herat, allowing the export of steel or iron products to northwestern Iran (this would depend on finding a viable route through the mountainous terrain near the border with Turkmenistan). Overall, even if only the Mazar-Andkhoy rail were to be built, the near-term priorities for railway development must remain (a) the construction and private operation of multimodal terminals, in particular in Mazar-i-Sharif, Andkhoy and potentially Herat; and (b) the prioritization of a safety regulator within the newly created Railway Authority, to ensure that the development of the rail system conforms to safety standards from the outset.

38. **Given the levels of uncertainty in each of these variables, flexibility and careful options analysis will be crucial.** This will hold true particularly in power. For example, the relevant transmission lines could be designed for both 500 kV and 220 kV, which might result in wasting 1% of the eventual capital cost, but with very large savings in time and cost for redesign (or a suboptimal system) in return. At the same time, care should be taken to avoid premature decisions that “leave money on the table”, by using public funds for investments that the private sector might have to make in any case. In the Southeast, for example, the deposit at Zarkhashan, which will most likely require power supply, should be integrated into the proposed South-East Power System (SEPS). The construction of SEPS itself should perhaps wait until the rights to Zarkhashan are awarded, to avoid using scarce public resources for infrastructure that would otherwise be funded by the private sector. At the same time, since the resource investments themselves are so uncertain both in scale and timing, the first wave of investments must have rationales that are strong enough to stand without the mines. In other words, the resource sector is used to prioritize rather than to validate investments in associated infrastructure. This principle will continue to hold throughout the other themes.
II. Livelihoods

39. **Mining value chain.** The number of indirect jobs generated by large mines can vary significantly, from 1.5-2 times direct jobs to 5-7 times. At Aynak, shifting from the low to the high end of that multiple would represent the creation of an additional 4-6,000 jobs. Extending that across the resource sector (excluding the steel mill) implies an opportunity of 45-60,000 jobs. While this would be a small dent in the overall under- and unemployment problem, it is nevertheless significant. Many of these jobs would be skilled or semi-skilled and likely to be created in urban areas, but others could be local and offer opportunities to the rural poor.

40. Specifically, to take Aynak as an example, the opportunities for domestic supply fall into two categories: first, basic goods and services for which the Afghan private sector could be competitive today; and second, goods and services not currently within domestic capabilities, but potentially becoming so with some investment. The first category will represent greater potential for short-term activity, and rural or more low-skill jobs; the second will have wider catalytic effects – as, for example, foundries supply better parts to both the mines and other manufacturers – and enable broader capability upgrade in the domestic private sector (a third category includes those goods and services unlikely to be procured domestically in the foreseeable future). At Aynak, supplying the top ten goods and services in the first category would generate roughly $390m during construction, and another $60m in recurring spending during operations; for the second, which will require more focused interventions, the top three items could amount to $180m in spending during construction and $50m of recurring expenditures.

41. Although the domestic private sector would be capable of supplying goods in the first category, it requires proper information to do so. A public-private mechanism must be built to do so – for example, facilitating the transmission of technical specifications from mines to suppliers, and credible prices and standards from suppliers to mines. This mechanism should also facilitate more complex knowledge and risk sharing for the provision of goods and services falling under the second category – such as business development and technical consultancy services, as well as access to finance for needed investments.

42. Such mechanisms have spread in recent years, and a rich experience can be drawn upon from programs across Africa and Latin America. One notable example has been Mozlink, in Mozambique, which helps SMEs supply goods and services to the Mozaal aluminium smelter built by BHP (see Box 1 above). By such actions as training on tender documents, technical mentoring, and breaking down tenders into manageable pieces, the program managed to increase local supply by 300% between Phase I and Phase II of the project. The near-term priority will be

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25 World Bank (2012); ICMM (2007), among others.
26 Such as cement, concrete, sand, stone, basic civil works and labor, etc.
27 Such as metallic piping, steel structures, and electric cables.
28 World Bank (2010); World Bank (2012); PWC (2008); Altai (2012b).
to pilot such a program with Aynak and Amu Darya, and expand to the whole sector in the medium term. Initial results may be limited, so persistence will be key: in Chile, the early suppliers of “category two” goods moved into more advanced supplies a decade later, while their employees created spin-offs, and the results of early efforts snowballed. Ensuring that these economic activities maximize domestic and inclusive employment will also require matching private sector needs with the large number of active skills-development programs.\(^{29}\)

**43. Downstream development.** The potential AFISCO steel mill will most likely offer the largest single opportunity for job creation and broader development. The original bid included a steel mill with a capacity of 7m tons per annum, which would be one of the largest in the world. A first phase of around 3m tons has also been discussed. Such a plant could viably supply a ‘home region’ consisting of Afghanistan, parts of Central Asia and northern Pakistan. This region is suffering a shortage of quality scrap and pig iron, its steel demand is expected to grow over the next decade, and existing suppliers face high logistics and input costs. Aggregate demand for this area could reach 4-6 million tons per annum by 2025, of which the mill could feasibly capture 50-60%, displacing mainly Turkish imports. In other words, the first-phase smaller mill has a strong commercial rationale, with potential upside if growth in Pakistan or western Iran is higher than expected.

**44.** This mill would require only the relatively short Dar-i-Suf rail link to Mazar-i-Sharif to be financed from public funds, with AFISCO already including the link from Hajigak to Dar-i-Suf in its business plan. Direct employment in the mill could vary widely: cutting edge plants of 2-3 million tons in the developed world employ 1,500 workers, but older profitable mills in developing countries, including India, employ ten to twenty times as much, with some up to 40-50,000.\(^{30}\) Based on industry standards, the operating expenditure of such a mill would total approximately $800 million, of which $500 million could be spent domestically (though the bulk would be on raw materials) according to industry experts.\(^{31}\) Further development opportunities are possible and would require utilizing mill byproducts, such as gas given off by the furnace for power and fertilizer; slag for cement and road foundation; and structural steel or grinding ball production for the mining industry (requiring a mini blast-furnace).

**45.** A potential “mini” refinery for the production from Amu Darya would offer a smaller, but potentially quite catalytic opportunity. This is currently being planned by the Watan Group, the domestic partner in the Amu Darya concessions. Based on ongoing feasibility studies and preparation work, the potential capacity could be as much as 60,000 bpd, which would require $600-800 million in private investment. This would refine three times the production of Amu Darya, and seems dimensioned for current levels of consumption, which may fall after Transition. Given the high delivered cost of refined fuel in Afghanistan, however, the

\(^{29}\) Altai (2012a).

\(^{30}\) For example, the Temirtau mill in Kazakhstan, or the SAIL integrated plant in Bhilai in India.

\(^{31}\) Cordellt (2012).
commercial case for such a refinery or perhaps a smaller one (such as 20,000 bpd) seems strong. Such a facility could reduce fuel costs in the country or supply power generation in Aynak’s early stages, depending on the product mix.

46. **Agriculture and agribusiness along the corridors.** Even in the best case, the full development across the value chain described above would create fewer than 100,000 jobs over the decade. Hence the primary source of inclusive growth from the resource corridor may stem from the induced effects it has on agricultural production. The first segments will increase connectivity between two of the main farming regions in the country: the northern segment stretches through five to six of the largest wheat-producing provinces in the country (which together account for 36%-42% of the country’s total production); and the eastern segment runs through some of the largest producing areas of fruits and vegetables (accounting for 38-51% of national grape production). On the other hand, “trunk” transport infrastructure per se does not seem to be a constraint on agriculture exports: there appears to be large unused backhaul – transport with a near-zero marginal cost – to neighboring countries. The binding constraints to agriculture and agribusiness development should therefore be understood in detail before being addressed, learning from the multiple large-scale agricultural development projects of the last decade. This is being undertaken through an ongoing agricultural sector review. The actions identified in that review will therefore complement the resource corridor strategy. To a degree at present unquantifiable, the inclusiveness of mining will ultimately rest on agriculture. Over the last decade, more public resources have been devoted to agriculture, whether directly or indirectly (such as through rural roads), than to the extractives industry. The resource corridor strategy would affect this balance only if the agriculture sector also begins to realize its potential. The resource corridor should therefore not be seen as a competitor to agriculture and agribusiness, but as a complement to it.

**Environmental and social impact**

47. **Overall impact.** For the resource sector itself, a Strategic Environmental and Social Assessment (SESA) was conducted in 2011-12 by the Ministry of Mines through World Bank funding. This highlighted risks to water supplies, through the creation of competing demands for water, as well as pollution risks from seismic activity if facilities to store used byproducts (e.g., “tailings dams” for copper processing) are not robust to seismic risks; the need to strengthen land management to enable efficient and equitable compensation and resettlement; and for means to

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32 For example, Russia intends to build 50-100 such refineries in the coming 5-7 years. On the other hand China is closing many such refineries to consolidate scale efficiencies (which may provide a source of low cost demobilized facilities).

33 Northern provinces counted: Faryab, Jawzjan, Balkh, Kunduz and Takhar, with extension option to Herat; Eastern provinces counted: Kabul, Kapisa, Parwan, Logar, with extension option to Ghazni. Source: CSO Statistical Yearbook 1388, Agriculture.

34 I.e., high capacity main transport routes, such as highways and rail lines, distinguished from “feeder” infrastructure such as secondary and rural roads
enable local communities to benefit from the investments. While some aspects of the SESA required strengthening, it has guided ongoing work to improve monitoring and compliance capabilities both within the Ministry and at the National Environmental Protection Agency (NEPA). The issues identified will also help to focus reviews by the Government of the Environmental and Social Impact Assessments (ESIAs) conducted by investors. This work will obviously be critical for the sustainability of both the resource investments and the resource corridor, placing a premium on the capacity of these agencies to conduct such reviews. Beyond the private investments themselves, to be sustainable the resource corridor will have to tackle the same three issues: water, land, and community benefits.

48. **Water for Kabul.** Given their proximity, the water resources for Aynak cannot properly be considered separately from those of Kabul. At present the city is drawing groundwater from medium-depth aquifers, which are being depleted (the water table having fallen 11m from 1990 to 2008) and likely contaminated since the city has almost no wastewater treatment system. Through its public pipes and private boreholes, the city draws approximately 30 million m³ of water per year, or a daily 16 liters or so per capita. This is at, or above, the sustainable amount that can be drawn from its aquifer. If Kabul grows to six million people by 2030, as some have estimated, and if per capita water use rises to the level of other low-income countries (40 liters per day), demand will rise to almost 90 million m³ per year, at least three times its current sustainable supply. This demand, however, could vary substantially and stochastically, and its evolution – e.g., if it rises first quickly, then slowly, or vice versa – is as important for investment decisions as the city’s end demand. This is because several of the investments needed to meet demand are capital intensive, and hence their returns are highly sensitive to benefits realized in their first years of operation.

49. At the same time, MJAM has claimed Aynak will require approximately 7-12 million m³ of water per year, even if built with benchmark standards of water reuse (as MJAM has agreed to do). But even 12 million m³ would be lower than the best achieved in Chile, a recognized leader in environmentally sensitive copper mining. It would be more prudent to consider 14-20 million m³, which would still be levels considered as best practice. The aquifer beneath Aynak is upstream from Kabul’s, and while their degree of interconnection is not known precisely, there is a significant risk that Aynak’s withdrawals will contribute to the depletion of Kabul’s supply. In any case, it will make that aquifer unavailable as a later source for Kabul. Aynak will therefore not be sustainable unless a solution is found to Kabul’s water needs, and the mine develops a second source of supply. Both involve using surface water: for the city, the construction of a dam, with the most likely candidates being at Shatoot on the Maidan river, requiring approximately $300 million in investment and at least five years for construction, or Gulbahar, requiring approximately $500 million and a longer time period for preparation; and Aynak

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35 Hevia, Bande & Guajardo (2012)
36 Figures for Kabul and Aynak from Pell Frischmann (2012).
37 Sakhrani (2012)
itself should also build a reservoir (‘impounding dam’) to utilize surface water. MJAM has commissioned a feasibility study on such a reservoir, and its cost and building time could vary significantly. This reservoir would provide another source of water for Kabul in the long term, after the mine stops operating.

50. A detailed evaluation of thousands of scenarios of demand evolution for Kabul itself, matched with similar uncertainty modeling for the sources of supply, support a win-win investment strategy in which the mine cross-subsidizes the city’s water supply. Under most demand and supply scenarios, developing the middle and upper Logar aquifers to supply Kabul is a robust option to meeting demand growth in the next decade. Under almost all scenarios, this would supply Kabul, irrigation in the area, and Aynak, if security conditions allowed access to the aquifers. Under a tail of scenarios, however, these would not suffice, and conflict over water demand might develop among Kabul city, irrigation, and Aynak. In most cases, Aynak is not a critical factor, given its relative size, with Kabul’s growing water demand a far greater threat to the Logar aquifers than Aynak will be. Building Shatoot or a similar dam would remove this tail risk by adding enough supply to prevent catastrophic scenarios from materializing in almost all cases. Yet Shatoot’s high investment costs make this option too expensive. However, given their operating economics, very high water charges typically make only a marginal difference to the profitability of copper mines, but a substantial difference to the financial returns of water utilities. Hence copper mines have a very high propensity to pay for water supply (as much as USD 4 per m3 in Chile). If Aynak can afford such a tariff, Shatoot might become economically and financially viable. In other words, Aynak could purchase an option on a more secure water supply for Kabul and the Logar region, if it is constructively integrated into the water system as part of the solution. This would be done, principally, by monitoring MJAM’s commitment to best practice water use levels, conducting thorough aquifer testing as soon as security permits, and charging a high but internationally comparable water tariff.38

51. Land acquisition. Land management is a particularly pressing issue, as substantial land acquisition will be required to enable investments along the resource corridor. After decades of conflict, Afghanistan’s land management system is governed by overlapping and at times conflicting legal systems. The lack of tenure security and of clear legal and policy frameworks dealing with land are causing conflicts among individuals and between communities. These disputes are exacerbating past and present ethnic and religious conflicts, impinging upon current development and rehabilitation programs, preventing a healthy and sustainable development of the agricultural sector, and undermining public trust in the ability of government to promote development and protect citizens and their rights. Only around one third of all cultivated land has been covered by cadastre. Limited and outdated land registration, added to the prevalence of customary claims and communal land rights, also pose substantial problems for resolving tenure issues. There is no country specific resettlement policy in Afghanistan (though there are

38 Ibid.
commitments to abide by global safeguard standards). The Land Management Law is under amendment, and the Law on Land Expropriation also needs to be aligned with international standards (in particular regarding resettlement). Both laws are lacking requisite rules and regulations. The lacunae in the regulatory framework are further compounded by the government’s weak implementation capacity and coordination difficulties, and results in substantial inconsistencies in the application of the law. As a result, investments in land verification (including titling, conflict resolution, etc.), and building government capacity to manage land acquisition, are both important on their own merits and vital to the resource corridor. The Afghanistan Land Authority (ARAZI) should be the focal point for such reforms and investment: both to manage the initial drafting and consultation of a new legal and policy framework; as well as to develop the core competencies necessary to manage issues of eminent domain along the geographic segments of the resource corridor. These competencies include: building a land information system; developing a land registry system; building up and assuming cadastre functions; and providing land lease services. ARAZI will require significant capacity building efforts. Since these reforms and investments are on the critical path to land acquisition, which itself lies on the critical path for infrastructure, they should begin as soon as possible. The initial focus should be on the areas needed for the development of the resource corridors, broadening out into sector-wide improvements.

52. **Community benefits sharing.** The licenses for both Aynak and Amu Darya contain provisions to provide benefits such as schools and clinics for the communities affected by the extractive investments. Licenses for the next deposits awarded are expected to contain similar provisions. The Ministry of Mines recently published Social Policy Guidelines for the mining sector identifying key social issues to be addressed by the Government, mining investors and civil society. Funding requirements likely to result from such provisions could be significant, and it is imperative to develop a framework for community benefits sharing to inform existing and forthcoming mining sector investments. The development of such a framework would need to be undertaken in close collaboration with other key stakeholders, notably mining investors and civil society. From global experience, such a framework should center on community development agreements (CDA), which involve communities themselves in setting priorities and help clarify roles, expectations and anticipated results. CDAs are negotiated between investors and each affected community, and outline mechanisms to determine how benefits are shared, such as minimum funding requirements and the representation of women and other marginal groups in decision-making. These agreements will be crucial to generate inclusive growth around the mines.

**Governance**

53. **Strengthen capacity at all levels.** The effective implementation of CDAs will help strengthen capacity at the local level. For the resource corridor approach to succeed, however,

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capacity must be built at all levels of government. The planning capacity of a number of line ministries and agencies must be strengthened, including the Ministry of Public Works; Ministry of Transport and Civil Aviation; Ministry of Commerce and Industry; Ministry of Information and Culture; Ministry of Agriculture, Irrigation and Livestock; Ministry of Rural Rehabilitation and Development; ARAZI; NEPA; the electricity utility DABS; and others. Perhaps most of all, capacity will need to be strengthened within the Ministry of Mines, which is the coordinating Ministry for the NRRCP, and within it the NRRCP Secretariat. One area that urgently requires coordinated support is the ability to maintain open and transparent communication and strong flows of information among all stakeholders: within the institutions of GoA; between departments in Kabul and the provinces; between government and the private sector; within the private sector itself; and with affected communities, as well as the Afghan population at large.

54. **Transparent and strong budget process.** As described in the opening section, the financial revenues from mining in the early 2020s are likely to range from roughly 2% of GDP – a prudent estimate – to possibly 4% of GDP, depending on the scale of new deposits and the pace of their development. Since the GoA by then may have a financing gap of some 25% of GDP, revenues from undeveloped deposits will not be available for ‘additional’ investment—like they would be in most other countries in a similar situation—but will be required for ordinary fiscal sustainability. As such, GoA has made the policy decision to treat the revenues from the sector within the normal budgetary process. Continuing to build the strength and transparency of the budget process will therefore be critical to the effective use of these funds once they arrive in the single account. Of particular importance will be the perceived effect of public spending in the provinces where the mines are located, and the perceived link to revenues from them (even if these links are not fixed directly in budget allocations). This is because governors and other stakeholders in those provinces will exert a strong *de facto* influence on the monitoring of contracts, revenue flows and the overall operating environment for the investments. The failure to strike a credible balance between central and provincial shares of revenues has caused longstanding problems in countries such as Nigeria and Iraq, fostering corruption in the former and holding back the development of the extractive industry in the latter.40

55. **Strong contract monitoring at the points of potential leakage.** Ensuring that full revenues reach the budget is as important as how they are handled once they are there. Underreporting of production or net income could reduce the flow of royalties or income tax substantially. More specifically, points of vulnerability are, on production, the reporting of tonnage produced, and on net income, the possible abuse of transfer pricing. On the former, the processes embedded in contracts once production amounts are recorded are relatively strong, involving multiple sets of accounts and provisions for GoA to access records at any time. Production would therefore have to be under-estimated at the source, with part of the goods not

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40 For example, Iraq’s hydrocarbon law has been delayed for more than seven years, principally due to disputes regarding revenue sharing with the provinces. The perceived unfairness of provincial transfers of oil revenue is often cited as a cause of conflict in Nigeria.
going through the mechanisms put in place to check the level of production. This risk is significant: the value of goods coming through the customs, for example, has grossly been underestimated for years. Because large international companies will handle production at the mines, they would either have to be complicit (and therefore have something to gain) or to be defrauded as well for underreporting to occur; since in all likelihood these companies will maintain their own management structure with its own staff, the latter hypothesis seems remote. As a result, the behaviour and incentives of those companies will be critical to control potential revenue leaks. At the same time, safeguards can be strengthened by ensuring the contract monitoring units within the Ministry of Mines are well trained, highly capable and have an impeccable professional ethos. Moreover, civil society organizations (CSOs) can be independent sources of monitoring and accountability, if their capacity is built and financial flows are transparent. The GoA’s recent entry into the EITI process will further this process.

E. CONCLUSIONS

56. Overall impact: investment, jobs and livelihoods. As described above, the employment directly and indirectly generated by the extractive sector would, even in an optimistic scenario, be modest. Some jobs will be created in construction of infrastructure, but, by industry standards, the construction of the Bamyan-Doshi road might employ 300-500 people, and maintenance some four people per kilometer. With six to eight such segments, and approximately 2,000 kms of direct corridor-segment roads, short- to medium-term priorities in roads might create at most 10,000 jobs. Making construction more labor intensive would increase this number, but experience has shown that doing so requires a very high degree of managerial skills and, aside from rural roads, is rarely done even in low-income countries. Similarly, employment in railways will likely be limited, as good quality railroad construction and maintenance is machinery intensive. With 530km of rail in the segments described above, and only half a job per km in O&M for similar railroads, the sector might create 250 jobs. Under the prudent assumption of a multiplier for indirect jobs at the low end of the scale (at 2.5), transport infrastructure would add some 25,000 jobs in total. Coal power plants might create a few hundred jobs, and coal mining operations a few hundred more, but gas-fired plants will create very few, and transmission lines hardly any. The dam and wastewater system might create further employment opportunities, but likely high skilled. In all, the upper range of job creation including the mines, O&M in related infrastructure, and indirect effects in the supply chains, might at the most reach 100-125,000, only once all deposits are developed and infrastructure built, in the mid-2020s at best. At the low end, the figure would be 50-100,000 (and would decline further if the steel mill did not materialize). On the other hand, the amount of investment will be very large: some $12-15 billion in private and public investment in the best scenarios (and $7-9 billion in moderate scenarios), creating fiscal flows of some $700-1.5 billion per year.

57. The inclusiveness of economic growth generated by the sector will rest on the downstream, induced impact of these investments: how they may spur agricultural
development; potential manufacturing expansion through cheaper and more available inputs (from power and steel to spare parts); and the fiscal strengthening derived from the financial revenues. These investments’ long lead times imply their realization must be sequenced first; in parallel to their preparation, actions must be identified to remove institutional constraints that would prevent the rural and urban private sector to take advantage of them once realized. Given the large number and size of programs that have attempted to support the private sector in the past, as well as their at best mixed results, such interventions should be targeted, innovative, and learn as much as possible from prior experience. On the other hand, the potential benefits from infrastructure to other sectors could be very large: in some developing countries, such as Ghana, mining investments have resulted in induced job creation over 10 times that of the direct and indirect employment generated, when they brought infrastructure to previously underserved areas where it was a binding constraint on other sectors.  

58. **Short-term priorities are to build soft infrastructure; initiate preparation for large, long lead-time items; develop instruments to address private sector risks; and make quick, small catalytic investments in hard infrastructure.** Various development partners’ programs are already tackling many of these priorities (e.g., the ADB’s transport program, the World Bank’s SDNRP II project and proposed development policy grant). Others are private sector investments. The highest priority interventions that are either unfunded, have uncertain funding, or require additional financing are: develop domestic firms’ capabilities to supply the mines; better match skills supply and demand; implement community development agreements to promote community benefits sharing; develop a grid code and integrate Aynak power plans into grid planning; construct multimodal rail terminals and operate them as PPPs (as well as a refinery, preparation for which is underway), for which careful design and solid implementation will be much more critical than money; implement road maintenance arrangements; build or upgrade key road links (especially Bamyan-Doshi and Jalalabad-Peshawar); and initiate the Kabul water strategy.

59. **Private investment outside the resources themselves requires realism in terms of timing and scale, and will need new risk-sharing instruments.** For example, some infrastructure investments can and should be privately funded. Railway terminals are often privately financed, and publicly financed terminals have a long history of failure. However, it must be noted that, given prevailing uncertainties, private investment, if it occurs, will be in small deals at first, no more than a few tens of millions of dollars, such as terminals, small industrial plants to use gas, or small gas-fired power. Only if these are successful, is private investment likely to scale up. Even for such initial deals, instruments should be developed to appropriately mitigate risk where needed, going beyond political risk alone, for example to guarantee off-take or supply agreements. The WB’s partial risk guarantees (PRGs) offer such an instrument, though they will need to be designed appropriately. As such, small and early private investments

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41 PWC (2008); World Bank (2012)
investments in downstream industries or a multi-modal terminal may provide valuable opportunities for experimentation and subsequent proof of concept.

60. **A total of $800 million - $1.2 billion in additional commitments is needed.** Most of that figure would in fact disburse in the medium term, but an immediate commitment is required to start design and contracting as soon as possible. In parallel, more detailed analytical work up to, and possibly including, feasibility studies need to be conducted on agriculture and agribusiness development along the corridor (as part of the ongoing Agriculture Sector Review); feasibility studies or design for power transmission options along the energy-steel segment (i.e., from Mazar-i-Sharif to Bamyan); as well as possibly for the Dar-i-Suf to Mazar-i-Sharif railway. In total these would likely cost a few million dollars and would allow medium-term options to be triggered rapidly, should favorable scenarios materialize.

61. **Medium term priorities – those in 2014-2018 – focus on the energy-steel segment as well as unlocking multiplier effects from the first wave of actions:** Medium-term actions will involve deciding between several large-scale options on hard infrastructure, complemented by a shifting geographic and sector focus for soft infrastructure. Specifically, on hard infrastructure, finalizing and then building the rail route from Hajigak to the north; and selecting and building the transmission line along the energy corridor. Other investments would be follow-ups or complements to those described above, namely a wastewater system in Kabul as well as the rehabilitation of the Salang tunnel. On soft infrastructure, the focus will shift to unlocking agricultural growth and, depending on the progress of Hajigak, preparing the ground for downstream development based on the steel mill as well as power investments (e.g., on gas finds in the north). These investments would be subject to far greater uncertainty than short-term interventions and have less public funding committed to them. They could require approximately $1.3 billion in additional public funds; on the other hand, were the resource investments realized, a further $1.1 billion would come from the private sector (e.g., in AFISCO’s internal infrastructure).

62. **Long-term priorities will be the completion of the initial segments; triggering potential extension options to the southeast; and deepening private sector development up-and downstream, as well as in agribusiness.** Clearly, long-term developments are even more uncertain. Two sets of options can however be identified: the first set is the extension segments, namely rail and / or power from Andkhoy to connect to Herat; a heavy-duty mineral railway from Hajigak to ports in Iran or Pakistan; and the extension of power and other infrastructure to the southeast to Kandahar, past Ghazni (this last option may be brought forward to the medium term, however, if the Zharkashan copper mine is built more quickly than expected). The other set of options involves expanding completed infrastructure from earlier stages, for example: a heavy axle-load highway upgrade of the Kabul-Mazar highway; expanding Kabul’s wastewater system; adding a pipeline to the energy corridor to carry gas from new fields in the north to Kabul; or the construction of larger power stations in the north to use gas from those fields. Several of these options would have large capital costs – each could cost more than $1 billion –
and would likely require funding in part from the private sector (potentially through funds redirected from earlier contractual requirements that subsequently turned out to be unfeasible, as could be the case for the “Aynak railway”).

63. **While it is almost impossible to tell what soft infrastructure will be a priority that far in the future, the continuation of programs begun as short-term priorities will remain crucial.** In particular, the development of the domestic private sector capability will need to deepen in sectors both downstream (e.g., utilizing steel for grinding media) and upstream (e.g. moving into higher value-added activities to supply the mines). Experience elsewhere has shown that while such programs often have limited effect in the short term – helping a few companies with a few hundred employees – a decade later these few companies have become the seeds of entire industries, not only growing themselves but spawning spin-offs founded by those few early employees.\(^{42}\) As such, maintaining a long-term commitment to these programs, and not abandoning them if early results seem small, will be crucial. At the same time, such initiatives will have to learn as they develop, correcting design features that prove ineffective. Similarly, interventions to unlock agriculture and agribusiness require many years to have a large-scale impact, likewise starting small to grow large, and likewise needing to adapt and learn. Beyond the funds for hard infrastructure, a long-term commitment to such programs – and the ability of such programs to adjust – will be the necessary precondition for the resource corridor to generate inclusive growth. Ultimately, the resource corridor is a long-term approach: its goal is to produce some results in three years, a few more in eight years, and a major transformation in fifteen or more years.

\(^{42}\) Muendler and Rauch (2011).
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